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TUMORS OF THE BREAST 641
CHARLES H. PECK, M.D. AND WILLIAM C. WHITE, M.D. . . . . NEW YORK
PAPILLARY CYSTADENOMA OF THE MALE BREAST 652
VERNON C. DAVID, M.D. . . . . CHICAGO
AN IMPROVED METHOD OF SKIN-GRAFTING 658
A. D. PARCE, MAJOR, M.C. U.S.A. . . . . .
ANTHRAX SEPTICÆMIA 663
DOUGLAS SYMMERS, M.D. . . . . NEW YORK
PERITONITIS COMPLICATING PROSTATECTOMY 668
H. J. VANDEN BERG, M.D. AND WM. J. BUTLER, M.D. . . . GRAND RAPIDS
SCIATIC HERNIA 672
JOHN EDWARD SUMMERS, M.D. . . . . OMAHA, NEB.
LATERAL VENTRAL HERNIA 677
JACKSON K. HOLLOWAY, M.D. . . . . PHILADELPHIA
LOW TRANSVERSE INCISIONS IN THYROID OPERATIONS 686
W. S. SCHLEY, M.D. . . . . NEW YORK
EXTRACRANIAL ANEURISM OF THE INTERNAL CAROTID ARTERY . . 688
NATHAN WINSLOW, M.D. . . . . BALTIMORE
WOUND OF FEMORAL ARTERY AND VEIN 705
G. PAUL LA ROQUE, M.D. . . . . RICHMOND, VA.
DAKIN'S SOLUTION IN THE TREATMENT OF OSTEOMYELITIS . . . 708
ABRAHAM O. WILENSKY, M.D. . . . . NEW YORK
SPIRAL FRACTURE OF THE LEG 717
JOHN A. CALDWELL, M.D. . . . . CINCINNATI
VOLVULUS OF THE SIGMOID 724
GEORGE LIVINGSTON HAYS, M.D. . . . . PITTSBURGH
BLOOD-PRESSURE IN ACUTE CEREBRAL COMPRESSION 732
JULIAN Y. MALONE, M.D. . . . . ST. LOUIS
TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY . . . 736
STATED MEETING HELD JANUARY 9, 1922.
TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY 746
STATED MEETING HELD JANUARY 25, 1922.
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ANNALS *of* SURGERY

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TUMORS OF THE BREAST*

BENIGN AND MALIGNANT—A REVIEW OF 331 CASES

BY CHARLES H. PECK, M.D.

AND

WILLIAM C. WHITE, M.D.

OF NEW YORK, N.Y.

THIS record includes 331 cases of tumor of the breast, 136 being benign tumors (forty-one per cent.) and 195 malignant tumors (fifty-nine per cent.).

The majority of these cases have been treated on the Second Surgical Division of the Roosevelt Hospital, the remainder being outside private patients of the authors. It is convenient to consider each group separately.

Benign Tumors and Cysts.—Analyzed from the pathologic standpoint, this group consisted of:

	Cases
Single cysts	23
Localized cystic mastitis	18
Generalized cystic mastitis	13
Papillary cystadenoma	9
Galactocele	2
Adenofibroma	50
Intracanalicular fibroma	14
Tuberculosis	3
Lipoma	2
Hæmatoma	2
	136

The single cysts were for the most part the typical blue-domed cyst of Bloodgood, which we find a relatively common lesion and believe to be always benign. That such cysts may be associated with carcinoma in the adjacent breast tissue, or at a distance, we do not doubt, but such association has not been observed in this series.

The operation of choice is local excision, including just enough adjacent breast tissue to insure complete removal of the cyst wall, which is so thin and adherent as to make true enucleation difficult or impossible.

None of the cases followed have developed malignancy and in one case only was secondary operation for another cyst, one year later, required.

* Read before the New York Surgical Society, January 11, 1922.

Localized Cystic Mastitis.—The cases of localized cystic mastitis, eighteen in number, differ in that more than one cyst, sometimes several of varying size, occur in a localized area of the breast, forming a distinct lump.

In this group a "V"-shaped wedge of breast tissue is excised from the deep surface, including the affected area; the incision being carried through normal breast tissue on etiher side. After careful hæmostasis, the cut breast tissue is carefully coapted by fine catgut sutures, placed separately through the anterior and deep capsule, including enough breast tissue to secure accurate apposition and prevent the formation of an hæmatoma.

This restores the contour of the breast and is done preferably through a curved incision at the lower border, the breast being reflected upward and the dissection done from the deep surface. The patient should always be warned that a lump will be felt in the breast at the site of excision, which will disappear by absorption in a few weeks' time. The cicatrix is covered by the overhanging breast and is usually quite invisible to ordinary inspection unless the breast is lifted. Two cases in this group developed a similar lesion in the opposite breast later, requiring secondary operation. One case had both breasts involved primarily.

We have long believed that unnecessary mutilation by the performance of radical operations for these distinctly benign conditions was unwarranted, and speaks for lack of ability or confidence in diagnosis by the surgeon, rather than consideration for the future comfort and safety of the patient.

The advice and support of a trained pathologist at the operating table, with frozen sections when in doubt of the nature of the process, is essential to the best interests of the patient in the modern treatment of breast tumors.

General Cystic Mastitis.—There were thirteen cases of general cystic mastitis in which the distribution of the cysts necessitated complete removal of the gland.

The Warren incision is used by preference, the breast being reflected upward and the entire gland removed from the deep surface. Occasionally only a part of the cysts will be tense enough to form palpable tumors, other flaccid or partly filled cysts being scattered throughout the remainder of the gland.

By conserving enough of the subcutaneous fat to build up a pad beneath the nipple by deep sutures, flattening and deformity when healing is complete, can be greatly diminished.

Papillary Cystadenoma.—Our belief that this lesion is essentially benign has been greatly strengthened by Bloodgood's valuable studies and contributions to the literature of this subject. This does not apply to smooth-walled cysts with bloody content, which are essentially malignant and should be so treated.

From a pathological viewpoint there does not seem to be any indication for a radical operation on papillary cystadenomata whether young or old. We have not seen any carcinomatous changes along with any of our papillary

cysts. Our radical operations for this condition were due to the earlier impression that they were potentially malignant. Clarke and Stout report that they have never seen malignancy develop from papillary cystadenoma.

Bloody Discharge from the Nipple.—Blood-stained discharge from the nipple without a palpable mass is not evidence of malignancy and does not call for operative interference. With the presence of a tumor it calls for operation.

Of our nine cases of papillary cystadenoma two had bloody discharge from the nipple. Complete mastectomy was performed in six of the nine cases, in five of which axillary dissection was also done. The remaining three were treated by local excision. The high percentage of radical operations in this group occurred in our earlier cases when we had greater fear of their potential malignancy.

Galactocele requires little comment; it is quite benign and simple enucleation of the cyst is all that is called for. It is relatively infrequent, only two cases appearing on our records.

Adenofibroma.—This group is the most important of the benign lesions as to diagnosis and selection of operative procedure.

Differentiation of types can be carried to an extreme, and pathologic variations are so numerous as to almost defy classification. A broad general distinction, however, can be made between growths which are distinctly encapsulated and those which are not.

Encapsulated Adenofibroma.—The encapsulated forms are benign and local excision is adequate and safe, even if the histologic type is so cellular as to engender the fear of possible malignant tendency. We believe that this is a safe statement and it is a viewpoint which Bloodgood emphatically supports. Two cases had tumors in both breasts, one case had a secondary operation one month later for a nodule probably overlooked at the primary operation. No case followed developed subsequent malignancy.

Non-encapsulated Adenofibroma.—Non-encapsulated adenofibroma, with or without cystic changes, occupies the borderland, and great care must be taken if such cases are classed as benign, and treated on this assumption. Nevertheless, many cases of this type are non-malignant, and with proper pathologic examination, immediately done by a competent pathologist, may be safely so considered. The gross appearance of the cut tissue is as a rule a better guide to its nature than even a frozen section, though the latter should always be used in doubtful cases. Pathologists of the widest experience, *e.g.*, Ewing, Bloodgood, Clarke and Stout, etc., concur in this opinion.

In this type of lesion other clinical factors must be considered: the age of the patient; the possibility of future pregnancy and lactation; the relative amount of glandular tissue involved; in deciding whether local excision is safe and desirable; whether complete removal of the breast, sparing skin and nipple is sufficient; or the typical radical operation as for cancer should be performed.

The two cases in our benign series in whom cancer developed later

were of this type and in both the complete radical operation was performed primarily.

We are greatly indebted to Bloodgood for his exhaustive and sane analysis of the pathology of this group published in the *Archives of Surgery* of October, 1921.

In two of the cases in this group the breast was completely removed without axillary dissection and in four a complete radical operation was performed.

Multiple tumors in a breast are usually adenofibromata, cysts or tuberculosis. Primary malignant tumors are rarely multiple.

Intracanalicular Fibroma.—Our fourteen cases in this group were all encapsulated, offered no special difficulties in diagnosis and were treated by enucleation or local excision.

This lesion is always safely classed as benign.

Tuberculosis.—There were three cases only of this lesion.

One case operated upon in April, 1912, for multiple masses in the right breast, had a similar process develop in October, 1912, in the left breast, which was also removed. Last examined in February, 1920, she was perfectly well and is believed to be so at the present time. She had a child four years before operation.

A second case is well seven years post-operative and the third died six years post-operative of a non-tuberculous malady.

Two cases of lipoma and two of hæmatoma were included in the records, but require no especial comment.

There were four secondary operations in the series already cited; one for single cyst, one for local cystic mastitis, one for adenofibroma and one for tuberculosis.

Two cases developed carcinoma, but in both, as already stated, the primary operation had been of the complete radical type.

Except for these two cases there have been no late deaths in any way connected with the breast lesion as far as known, and there was no immediate mortality in the series. Some of the other facts noted were as follows:

Sex.—Males: 8
Females: 128
Of the females: 44 were single
76 were married
8 were widowed
8 not recorded

The patients who had lactated numbered: 39
The patients who had not lactated numbered: 62
Not stated: 35

Bleeding from the nipple was recorded in six cases:
2 of papillary cystadenoma
1 of local cystic mastitis
3 of adenofibroma

The types of operations performed were:

Complete Mastectomy		15 cases
(Skin and nipple was left in ten cases)		
General cystic mastitis	8	
Local cystic mastitis	1	
Single cyst	2	
Adenofibroma	4	
Papillary cystadenoma	1	
Tuberculosis	1	
		15 cases
Complete Mastectomy with Axillary Dissection		19 cases
The conditions for which this was done were:		
General cystic mastitis	4	
Local cystic mastitis	4	
Adenofibroma	2	
Papillary cystadenoma	5	
Tuberculosis	2	
		19 cases
Partial Mastectomy		12 cases
Local Excision or Enucleation		90 cases
Total		136 cases

The types of incision were:

Curved at lower border	85
Radial	16
Curved at areola	1
Oblique ovoid	22
Transverse ovoid	12

Summary.—(1) Benign tumors or cysts of the breast can be definitely diagnosed at the operating table in a high percentage of cases, and should be treated by conservative surgical procedures. Mutilating radical operations for such conditions are unnecessary and are a confession of ignorance or timidity on the part of the surgeon.

(2) A trained pathologist should be present at the operating table to assist the surgeon in determining at once the nature of the pathologic process.

(3) Cysts of the blue-domed type and localized and generalized chronic mastitis are neither malignant nor precancerous conditions and should not be so considered.

(4) Non-encapsulated tumors of the adenomatous type form a borderline group. They are by no means always precancerous lesions and in younger women radical operations should be avoided if possible. In older patients, and when the amount of breast tissue involved is considerable, radical operation may be indicated.

(5) Multiple primary tumors or cysts are rarely malignant. Possible exceptions to this rule, *e.g.*, a carcinoma developing in a breast already the seat of a benign tumor, have not been observed in this series. This rule does not apply to advanced cases of carcinoma with outlying nodules which are really secondary deposits.

(6) Conservative operations should, when possible, preserve the contour of the breast, and incisions so placed as to leave an inconspicuous cicatrix.

The curved incision at the lower border (Warren) best meets this requirement.

MALIGNANT TUMORS OF THE BREAST

There were 195 cases of malignant disease of the breast in this series, of which four were sarcoma and the remaining 191 carcinoma.

Of this number follow-up reports have been obtained in 118, fifty-nine being dead, or alive with recurrence; fifty-three are alive and well at the present time, twenty-seven of the latter having passed the five-year mark; six post-operative deaths occurred while the patients were still in the hospital.

The unexpected sources from which some of our follow-up information has come would indicate that probably not all of the seventy-seven untraced cases are dead, though the proportion cannot be stated. To cite an illustration, within the past fifteen months, two sisters, operated upon in 1910 and 1912, respectively, from whom no report had been received for several years, were both found to be quite free from recurrence when one was brought to the hospital for acute perforative cholecystitis in October, 1920. Cured cases often wish to forget their unpleasant experience and fears and avoid reporting to the surgeon for fear of something wrong being found.

One can hardly speak of percentages of cures with so many cases untraced, nevertheless the results show some measure of encouragement in spite of this fact.

There were six deaths from the immediate effects of the operation: three due to embolus on the seventh, tenth and fourteenth days post-operative, respectively. One died of shock within twelve hours. One died of cardiac failure due to preëxisting cardiac disease on the fourth day. One died of wound sepsis on the seventeenth day.

In regard to the operative procedure, the following facts have been tabulated:

Complete mastectomy with axillary dissection was done in all of the 195 cases.

Excision of the thoracic portion of the pectoralis major muscle in 186 cases.

Excision of the pectoralis minor muscle in seventy-one cases.

Division of the pectoralis minor muscle with resuture in fifty-four cases.

Excision of a part of the sheath of the rectus abdominis in twenty-three cases.

Plastic or sliding flaps in eight cases.

Skin graft in five cases.

The oblique ovoid incision or some modification of it was done in 114 cases.

The transverse ovoid incision of Stewart was done in eighty-one cases.

The transverse incision of Stewart has been the operation of choice for some six or seven years past. The resulting scar is well placed and does not encroach on the shoulder or arm; there are no cords of cicatrix to interfere with free-arm motion; the exposure of the axilla to its highest point is excellent. The direction of the incision facilitates sliding upward of the lower flap so that skin grafting is rarely necessary, even after removal of larger areas of skin. The pectoralis minor is usually preserved either by division and resuture, or better, by retraction for axillary dissection.

We believe that it tends to protect the axillary vessels from constricting cicatrices and minimizes the danger of œdema of the arm which we rarely see in a marked degree.

We employ block dissection from above and within downward and outward, following the plane beneath the pectoralis major and removing the sheaths of pectoralis minor and serratus magnus. The axilla is drained through a stab wound. We do not excise the supraclavicular glands, having felt that if the disease has involved this group the prospect of a radical cure is slight.

We have not made a special point of excising a portion of the sheath of the rectus abdominis, though it has been recorded in twenty-three of the series and has probably been done in a larger number without mention in the history. It is usually done when it comes naturally in the field of a wide block dissection, as is frequently the case.

We follow the teaching of Handley in making a wide oblique dissection of subcutaneous fat well out beyond the edges of the skin incision, thus removing a greatly augmented area of subcutaneous tissue and muscle sheath.

We believe that extension by diffusion in all directions from the primary growth, especially in the lymph-spaces of the subcutaneous tissue, is a factor of importance.

In doubtful cases the tumor is completely excised with a safe margin of adjacent tissue and immediately cut and inspected by a pathologist and the operating surgeon.

In the majority of malignant tumors gross inspection of the cut surface is quite sufficient to determine the diagnosis, but if doubt exists the result of a frozen section is awaited. We feel that a frozen section diagnosis is of great value in some of the doubtful cases. It should always be interpreted, however, in conjunction with the appearance of the gross section, the presence or absence of encapsulation and the general clinical picture.

Delayed Radical Operation.—We have had eleven cases in which the primary excision of the tumor was followed at an interval of days or weeks by radical operation as a result of pathologic findings: in seven cases the interval was from three to seven days; in two cases two weeks; in one case four weeks and in one case three months. Of the nine cases followed, five are alive and well at ten months, eighteen months, five years, eight years and

ten years, respectively; four died or had recurrence at four months, nine months, one year and four years, respectively. Two cases have not been traced.

Delayed radical operation after excision of the tumor for diagnosis is never the procedure of choice, but as our results show, is not invariably followed by fatal recurrence; in fact, though the number of cases is small, the percentage of cures is quite as large as with the other methods.

Diagnostic Points.—The history of the length of the time the tumor has been observed, we have found to be of little help. The same may be said of the lack of retracted nipples, adhesions to the superficial or deeper tissues, palpable axillary lymph-nodes, pain and tenderness or history of trauma.

TABLE I

Local Exploratory with Secondary Operation Later

	Interval	Tumor	Present
1	2 weeks	Medullary no metastasis	O.K. ten years
2	3 months	Adenocarcinoma with metastasis	Died one year later
3	7 days	Adenocarcinoma with metastasis	Recurrences 4 months later
4	27 days	Medullary carcinoma no metastasis	O.K. 10 months
5	2 weeks	Adenocarcinoma no metastasis	O.K. 18 months later
6	3 days	Scirrhus carcinoma with metastasis	O.K. 8 years
7	4 days	Scirrhus carcinoma with metastasis	Died 9 months later
8	6 days	Medullary with metastasis	Died 4 years later
9	2 weeks	Adenocarcinoma no metastasis	O.K. 5 years
10	3 days	Scirrhus carcinoma no metastasis	Lost
11	1 week	Medullary no metastasis	Lost

Metastasis means axillary involvement.

Presence of retracted nipples and adhesions to the superficial tissue, as shown by the orange-peel appearance, on the contrary, are of great help. Axillary nodes are often palpable in benign tumors and often not palpable in malignant tumors. The sense of hardness is often of some help, while multiple primary nodules rather point toward a benign condition, but not absolutely so.

When cut open after the tumor has been excised, one may be influenced by the gritty hard feeling to the knife, the absence of capsule and the minute yellow dots.

In the case of a sarcoma, one is more dependent upon a frozen section, because the gross picture is often confused with an œdematous adenofibroma.

We have not had any malignant tumor in a patient under twenty-five years of age, but in the presence of absolute signs we would not hesitate to do a radical operation in a young woman under that age.

The cases described as Paget's disease were frankly malignant, and although they did not perhaps come under the original description by Paget, still we have called them by that name, because of the general custom. Both of these cases were lost to our recall system.

The one case of sarcoma that we have followed has been alive for nine years, and is now well. The diagnosis was made by a competent pathologist, but we have no microscopic description or slide of the case.

The carcinomas have been put in three classes, although it is admitted that it is not a division into very distinct groups, and our recall notes do not help us show that there is any particular difference in their virulence, in spite of the general tradition. What we have noted is what we would have expected, that the cases without metastases have a better outlook.

We have used post-operative X-ray treatment as a routine procedure for the past three or four years, but the cases are too recent to draw conclusions

TABLE II

Recurrences or Deaths

Years	Adeno-carc. with Metas-tasis	Adeno-carc. without Metas-tasis	Scirrhus carc. with Metastasis	Scirrhus carc. without Metastasis	Medullary carc. with Metastasis	Medullary carc. without Metastasis	Carcinoma with Metastasis	Cancer with Metastasis	Cancer without Metastasis
0	8	0	1	1	3	0	0	12	1
1	9	3	1	0	5	1	1	16	4
2	2	0	3	2	3	0	0	8	2
3	3	0	0	0	3	1	0	6	1
4	1	0	0	2	1	0	0	2	2
5	0	1	0	0	0	0	0	0	1
6	1	0	0	0	0	0	0	1	0
7	1	0	0	0	0	0	0	1	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	1	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	1	0
								48 cases	11 cases

from. We believe that it is good insurance and may retard or prevent recurrence in certain cases. We also advise X-ray or radium when recurrence is actually present and think it effects retardation of the growth and often gives increased comfort, but up to the present time we have seen no cases cured.

A study of the histories of the 195 cases brought out some facts of interest in history and physical examination—only positive statements are recorded:

57 cases had retracted nipples.

16 cases had ulcerated skin areas.

94 cases showed adhesion to the skin.

31 cases showed adhesion to deep muscles.

9 cases showed multiple nodules (mostly advanced cases with secondary nodules).
77 cases showed palpable axillary nodes.
109 cases showed axillary nodes involved at time of operation.
70 cases had lactated previously.
68 cases had not lactated previously.
15 cases gave a history of previous trauma.
15 cases complained of pain and tenderness.
There was only one male in the series.

Analysis of the pathologic findings and their relation to results as shown in the tables is of considerable interest:

TABLE III

No Recurrence. Alive and Well Now.

Years	Adenocarc. with Metastasis	Adenocarc. without Metastasis	Scirrhus carc. with Metastasis	Scirrhus carc. without Metastasis	Medullary carc. with Metastasis	Medullary carc. without Metastasis	Carcinoma with Metastasis	Carcinoma without Metastasis	Total Cancer with Metastasis	Total Cancer without Metastasis
0	1	0	2	2	1	3	0	0	4	5
1	2	3	0	1	0	2	0	0	2	6
2	0	0	1	2	0	1	0	0	1	3
3	0	2	0	2	0	0	0	0	0	4
4	0	0	0	0	0	1	0	0	0	1
5	0	1	1	1	3	0	0	0	4	2
6	0	2	0	0	0	1	0	0	0	3
7	1	1	0	0	2	2	0	0	3	3
8	0	2	1	0	0	0	0	0	1	2
9	0	1	0	1	1	0	0	1*	1	3
10	0	1	0	0	0	0	0	0	0	1
11	0	2	0	0	0	0	0	0	0	2
12	0	1	0	0	0	0	1	0	1	1

* 1 equals fibrosarcoma

Cancer with metastasis 17
Cancer without metastasis 36 } 53

78 cases were classed as adenocarcinoma.
53 cases were classed as scirrhous carcinoma.
58 cases were classed as medullary carcinoma.
2 cases were classed as Paget's disease.
4 cases were classed as sarcoma.

Of the fifty-nine cases traced which died or have recurrences, forty-eight cases had axillary glands involved at the time of operation; eleven cases had no axillary gland involvement.

Of the fifty-three cases now alive and well, seventeen cases had axillary glands involved; ten of these are well more than five years; thirty-six cases had no axillary involvement; seventeen of these are well more than five years.

Cases Operated Upon Before January 1, 1917 (More Than Five Years Ago)

We have definite follow-up information on sixty-nine cases operated upon more than five years ago. Of these there are:

Dead or alive with recurrence		42
With axillary metastases at time of operation	33	
Without axillary metastases at time of operation	9	
	42	
Alive and well		27
With axillary metastases at time of operation	10	
Without axillary metastases at time of operation	17	
	27	
		69

A study of this group shows that our percentages correspond closely with those reported by Sistrunk and McCarty in the ANNALS OF SURGERY for January, 1922; of our 69 cases there were:

Alive and well more than five years	39 per cent.
Alive and well more than five years; cases with metastases	23 per cent.
Alive and well more than five years; cases without metastases	65 per cent.

PAPILLARY CYSTADENOMA OF THE MALE BREAST*

By Vernon C. David, M.D.
of Chicago, Illinois

The occurrence of tumors in the male breast is relatively uncommon. Of 2420 cases of breast tumor collected by Roger Williams,[1] only twenty-five, or one per cent., occurred in the male breast. Gebele[2] reported 359 consecutive breast tumors from Angerer's clinic, of which not one occurred in the male breast. Of the twenty-five cases reported by Williams, sixteen were carcinoma, three were sarcoma, two were myxoma and one each were adenoma, lipoma, angioma and cystoma. The rarity of benign tumors of the male breast is emphasized by these statistics. Schuchardt[3] collected nearly 500 tumors of the male breast from the literature, a large per cent. of which were carcinoma. He collected instances of nearly all of the benign tumors of the breast, including five papillary cystadenomas.

The cystic feature of a large proportion of benign tumors of the breast is well known. Bloodgood,[4] in a recent well-illustrated article, has classed all cystic tumors of the breast as chronic cystic mastitis and has demonstrated adenomatous, cystic and inflammatory features in practically all of the varieties. Even the papillary structure of the epithelium is occasionally, and in some instances frequently, found in the different types of cysts.

Probably the most commonly seen cysts are the large ones which are slow growing and usually appear before the menopause. They are smooth-walled, contain clear or cloudy fluid (blue-dome cyst, Bloodgood) or contain a milky fluid (galactocele). They occur in breasts undergoing adenomatous and not infrequently inflammatory changes.

Diffuse cystic mastitis, often affecting both breasts and associated with multiple small cystadenomas and inflammatory reaction in the stroma, is a much discussed lesion, not only in an attempt to accurately catalogue it pathologically, but also to ascertain its tendency to malignant degeneration. Astley Cooper, Reclus,[5] Schimmelbusch,[6] Konig,[7] Saar,[8] Warren,[9] and Bloodgood[10] have especially contributed to our knowledge of the pathology and clinical picture of the disease. This condition, often referred to as Reclus disease, Schimmelbusch disease, chronic cystic mastitis or senile parenchymatous hypertrophy, is regarded, respectively, as a cystadenoma, an inflammation with cyst formation, or a hypertrophy of the epithelium of the acini with cyst formation. Papillary outgrowths in the cysts are frequently described and regarded as an inclination to malignant degeneration, which actually occurs in about ten per cent. of the cases.

Another relatively common cyst in the breast is the duct cyst or duct papillary cystadenoma, which may be single or multiple, involves the large

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ducts of the breast and is usually situated under the nipple. Greenough and Simmons,[11] Deaver and McFarland,[12] Bloodgood, Judd [26] and Lewis have given splendid descriptions of this lesion. Greenough and Simmons have reported twenty cases from the records of the Massachusetts General Hospital and Deaver has collected forty cases from the literature. As it is this type of tumor which serves as the subject of the report, a summary of its chief characteristics will be given.

Incidence of Age.—Thirty-five per cent. of the cases were in patients under fifty years of age and thirty per cent. were between fifty and seventy. The youngest patient was nineteen and the oldest eighty-one.

Incidence of Sex.—This tumor is essentially one of the female breast. In a fairly comprehensive search through the literature, only eleven cases have been discovered in which the tumor was present in the male breast. A few others are described in which carcinoma of the male breast probably resulted from a malignant degeneration of a papillary cystadenoma of the male breast.

Location of the Tumor.—The tumor is usually under the nipple or near it. It is seldom bilateral. It rarely projects above the surface of the skin. It is well circumscribed and not attached to the skin or pectoral fascia except in very old neglected cases, where the skin may be adherent to the tumor and undergo color changes incident to interference with circulation. Six of the thirty cases reported by Greenough and Simmons had the skin over the tumor adherent to it. The nipple may be somewhat retracted when the tumor is under it.

The Size of the Tumor.—The size of the tumor depends somewhat upon the length of time it has been present, but usually varies from a small nodule to the size of one's fist. The average size is about that of an English walnut. Rarely the cyst may rupture externally and present a fungoid cauliflower appearance which has been described as pseudo-sarcoma phyllodes (Müller).

The duration of the tumor in the described cases has been about two years.

Axillary glands are usually not enlarged, though Greenough and Simmons report two cases with enlarged axillary glands which were probably on an inflammatory basis.

Symptoms.—The most characteristic symptom, in addition to the slowly growing tumor under the nipple, is a discharge from the nipple, which is present in about seventy-five per cent. of the cases. The discharge is usually milky but may be bloody. Deaver states that twenty-five per cent. of the cases have a bloody discharge. Pain may be present and is usually in the region of the tumor. It is not a prominent symptom and is present in only about one-third of the cases.

Pathology.—In addition to the gross appearance of the tumor already described, on cross-section the tumor consists of one or more cysts containing blood-stained fluid. The whole cavity of the cyst may be filled with red friable tissue which is papillary epithelial growth. More commonly only one part of the wall of the cyst has undergone papillary proliferation, while some

of the smaller cysts may have no papillary outgrowths from the cyst wall. These papillary structures may have a pedunculated or a sessile attachment to the wall of the cyst. In the latter instance they appear somewhat like sago, being rounded and of dull color, while in the former they consist of waving, finely divided, arborescent epithelial processes. Where the cavity of the cyst has been filled by the papillary outgrowth, the cross-section of the tumor may appear more like a solid tumor with a soft friable bloody centre.

Microscopically the wall of the cyst is lined by a columnar or cuboidal epithelium, unless the cyst is quite old, where the epithelial lining may be absent except over the papillary outgrowths. The papillary processes usually have a branched connective-tissue stalk in which are small blood-vessels. When they are sessile and have a wide basal attachment on the cyst wall, the cyst can be distorted by their growth, with the result that many branching clefts are formed and in the end cauliflower or leaf-like structures result that have been named pseudo-sarcoma phyllodes (Sarr [8]).

The fine arborescent papillary growths undergo degeneration and necrosis and bleeding takes place into the cyst.

The connective-tissue stroma surrounding these cysts is often overgrown and rich in nuclei. Hyalin degeneration is seen in some areas and foci of round-cell infiltration are common.

After local surgical removal of these papillary cystadenomata of the ducts, recurrence may take place. Greenough and Simmons report two recurrences in ten cases where local removal was done. One of these recurrences was reoperated upon and the tumor was found to be of the same structure as the original tumor. The other recurrence was not reoperated upon but the recurrence did not appear malignant.

Ziegler and Kaufmann both speak of the tendency of these papillary tumors to undergo malignant degeneration. Tietze [13] thinks ten per cent. undergo malignant degeneration. In Greenough and Simmons' cases, fifteen per cent. had undergone malignant degeneration.

Treatment.—In view of the tendency to malignant degeneration shown by these tumors and of their tendency to recur after local removal, it is the prevailing opinion that they should be treated by removal of the breast.

CASE REPORT

The case to be reported, occurring in a male breast, is unusual in addition to the sex of the patient from the standpoint of the patient's age, the duration of the tumor, its recurrence after local removal as well as its appearance after eleven years' growth.

A male, eighty-two years of age, was admitted to my service in the Cook County Hospital in August, 1921. Considering his age, his general condition was good. Fifteen years ago he noticed a small lump under the left nipple and shortly after this, a milk-like discharge from the nipple began which persisted until local removal of the tumor and nipple three years after its first appearance. About a year after the local removal, a small nodule developed to one side of the scar and this has grown slowly. Later two other nodules developed in close proximity to the first recurrence, and these have slowly but steadily grown for

FIG. 1.—Cystadenoma in a male breast.

FIG. 2.—A. Papillary outgrowth arising from the cyst wall.
B. cyst wall. Note absence of epithelial lining.

the past eleven years until they fused together into a three-knobbed tumor, which during the past few years has been attached to the skin overlying the tumor (Fig. 1). The skin has become thin, shiny and discolored, ranging from blue at the base of the tumor to red at the apices of the three prominences. During the past two years, a small tumor the size of a walnut, has been developing apart from the main mass at the lower border of the pectoralis major in the lower outer quadrant of the breast. This tumor is only slightly attached to the skin and has relatively little color changes over it. All of the tumor mass is movable on the pectoralis fascia. The axillary glands are not enlarged.

The pre-operative diagnosis was tumor of the male breast, probably sarcomatous in nature, due to its resemblance in appearance to sarcoma of the fascia lata, for example, which in color, consistency, nodular appearance and attachment to the skin it closely simulated. Against this diagnosis was the general health of the patient, the length of time the tumor had been present, mobility of the tumor on the fascia of the pectoralis and absence of metastases.

The tumor, including all of the skin over it, was widely removed as well as all of the pectoralis major muscle and fascia up to the attachment of the muscle to the humerus. This was done under local anæsthesia and was well borne by the patient. A defect the size of the palm of the hand was left which was Thiersch-grafted three days later. All of the grafts took and the old man was discharged from the hospital. He has been under observation only four months, but up to the present time is well and relieved of his discomfort.

Pathology of the Tumor Removed.—On cut section, the tumor nodules were found to be cystic, containing bloody fluid under tension. For the most part the walls of the cysts were smooth, but over areas of from two to three centimetres on the walls of the several cysts, small sessile hyalin-looking bodies were seen which, though not arborescent in character, grossly resembled papillary projections of the epithelium. Sections through these areas did not reveal any tendency to breaking through the walls of the cysts.

Microscopically, the walls of the large cysts were not covered with epithelium but projecting into the cavity of the cysts were stalks of connective tissue containing blood-vessels which were covered with low columnar epithelium. At no place were epithelial cells found invading the wall of the cysts or the stroma surrounding them. Free, unattached pieces of epithelium of the same papillary form were found in the several cysts.

The stroma was rich, had numerous areas in which blood pigment was seen as well as areas of hyalin degeneration of the connective tissue and regions which contained clumps of round cells.

The diagnosis was recurrent papillary cystadenoma of the ducts of the breast.

In reviewing the literature a small number of similar tumors occurring in the male breast were found recorded. Perhaps the most elaborate description of a case is by B. Worbs,[14] who made the case report the subject of an Inaugural Dissertation (Bonn, 1902), a copy of which I have been able to secure from the library of the Surgeon General at Washington.

His patient was a male, forty-five years of age, who for ten years had noticed a tumor under the nipple which was accompanied by an occasional discharge of milky fluid from the nipple. The tumor had gradually grown in size until it reached the size of a fist and the skin became blue over it. The nipple became slightly retracted, but no axillary glands were palpable and the tumor mass was movable on the fascia of the pectoralis major. The author removed the tumor, leaving the muscle and fascia under it. On opening the cysts, which had bloody

fluid contents, the walls were for the most part smooth, but in places contained small cauliflower excrescences which nearly filled some of the smaller cysts. One small cyst was completely filled with papillary outgrowths and gave the appearance of a solid tumor. On microscopic section, the cysts were lined with high cylindrical epithelium and sections through the papillary structures showed connective-tissue stalks covered with low epithelium. The stroma around the cysts was rich and contained many areas of round-cell infiltration.

Case II.—Reported by Strasser,[16] and quoted from Deaver and McFarland, was a male sixty-three years of age with a tumor of the breast of four years' standing, which had been accompanied with a serosanguineous discharge from the nipple.

Case III.—Reported by Russell,[16] and quoted from Deaver and McFarland, was in a male sixty-three years of age with a tumor of the breast of four years' standing, upon removal of the breast a cystadenoma of the duct was found.

Case IV.—Reported by Williams,[17] and quoted from Deaver and McFarland, concerns itself with a pathological specimen from the male breast in the Hunterian Museum which corresponds to the tumor under discussion.

Case V.—Tietze [18] reported a breast tumor in a young man where first one breast and then the other was involved by a tumor about the size of a walnut and was accompanied by pain. On removal of the tumors and microscopic examination of the same, a rich connective-tissue stroma was found surrounding a cyst wall which had definite infoldings and which produced papillary structures in the cyst. This is a case where some doubt exists as to the papillary cystadenomatous character of the tumor.

Case VI.—Reported by Greenough and Simmons as a case of Dr. William Conant [18] at the Massachusetts General Hospital, where a male fifty-one years of age had a tumor of the breast, walnut in size, which had been present four months. The tumor was in the upper outer quadrant of the breast and was accompanied by a bloody discharge from the nipple. At operation a papillary cystadenoma of the ducts was found and the breast was amputated. At the end of sixteen months the patient was well and no recurrence had taken place.

Case VII.—Blasius [19] removed a pea-sized papillary cystadenoma from a male breast.

Case VIII.—Gowland [20] reported a duct cyst in a male breast.

Case IX.—Hewett [21] observed a papillary cystadenoma of the duct in the breast of a male fifty-five years of age.

Case X.—Silva Amado [22] observed cystadenoma with papillary outgrowths from the cyst wall in a male.

Case XI.—Morgan [23] reported a papillary cystadenoma of the male breast.

Several cases are reported where carcinoma developed upon what was a benign papillary cystadenoma of the duct in the male breast (Peachell,[24] Shattuck [25] and others).

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AN IMPROVED METHOD OF SKIN-GRAFTING

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Skin-grafting has been practiced since primitive times. Many unique methods have been devised and used by the surgeon with varied success. But it goes without saying that a thorough working knowledge of these different types of skin-grafts with their indications is the "sine qua non" of the successful plastic surgeon, and without it he will be at a loss to account for his failures. It should be generally understood that the principles of skin-grafting are to be applied only to superficial lesions, but frequently the contour of such lesions is so irregular, so uneven, that the surgeon is put to his wits' ends to devise a method whereby his graft can be kept in accurate coaptation with the underlying tissue throughout the extent of the lesion and this condition be uniformly accomplished at each sitting.

Confronted thus with a series of such problems following war wounds of different types and receiving his inspiration from the Esser epithelial inlay (vide, Annnals of Surgery, March, 1917), Colonel Keller conceived the idea of applying the mechanical principles that underlie and form the basis for success in the Esser epithelial inlay to the needs of general surgery. These principles are accurate coaptation of the graft throughout the area to be epithelized, combined with firm pressure and tension over this area. If these three things can be accomplished, then no secretion of any consequence can form beneath the graft and separate it from the granulating surface and conditions are now propitious for the budding capillaries to extend upwards and take root, as it were, in the graft, and thus render it viable. Furthermore, these same three factors prevent, to a large degree, the condition of passive congestion or venous stasis which, as is well known, would in itself be fatal to the viability of the graft after three or four days.

The operation to be described has been of particular value in treating old contracted scars with poor nutrition and often surmounted with indolent ulceration, which it was impossible to sterilize, or to cover with healthy granulations. It has served to break the continuity in painful or contracted scar tissue without ulceration, but which contraction prevented the full function of the part. It has also served to fill in cavities or bony defects following chronic osteomyelitis, and finally it has resulted in the area under treatment being covered with epidermis of normal appearance, a desideratum of no small consequence when cosmetic results are desired.

The technic of this operation is as simple as it is universally applicable where skin-grafts are indicated. It consists in the usual preliminary preparation and the use of the same instruments that one would employ if he were doing a simple Thiersch graft plus the addition of sterile dental modelling composition. With two basins of sterile water—one hot and one cold—

conveniently at hand, the dental composition is first softened in the hot water and then moulded over the surface to which the graft is to be applied and finally placed in the cold water to harden. If the surface to be treated is a broad, flat one, the moulding of the composition may be facilitated by compressing it between two sterile wooden tongue depressors or it may be flattened by using the round handle of some instrument in the same fashion as one would use a rolling pin, until it has reached a suitable thickness. This layer of composition while soft is then held in firm contact with the area to be epithelized and so in this way receives an exact impression of the deformity to be treated. In the event that this deformity is in the shape of a cavity or depression, a sufficient amount of the softened composition is used to fill the defect entirely, and it is held there by firm pressure until hardened sufficiently to permit removal, when it will bear the imprint of every nook and crevice that must be covered with epithelium. A full thickness autoplastic graft through the dermis into the subcutaneous plexus, but devoid of fatty tissue, is removed with a razor in the ordinary manner, turned inside out over the impressioned surface of the composition and held under tension against it by means of fine catgut sutures used to approximate the free edges of the graft across the blank surface of the composition. It may take several grafts before the surface of the mould is covered in the desired fashion. The skin edges about the area to which the graft is to be applied are slightly undercut, so that the margins of the composition with the graft overlying them will slip under these edges. The graft is now placed in position and adjusted, this adjustment being made more accurate by applying a compress soaked in hot saline to the composition for a moment, slightly softening it, when firm pressure will permit such readjustment as is necessary in the composition after the skin has been applied over it. The skin margins surrounding the area made free by undercutting are now sutured with fine catgut to those portions of the graft in apposition to them, which step serves the double purpose of holding the graft in position and at the same time helps to maintain tension on it. A copious dressing with a firm bandage is then applied over the whole area and left undisturbed for a period of eight to ten days, when the sutures holding the graft to the mould are cut, the edges of the composition gently lifted so as not to disturb the graft, and finally the whole mould is removed, leaving the epidermized surface beneath.

REPORT OF CASES

CASE I.—The first patient on whom this operation was performed but in a slightly modified manner from that described above, yet with most gratifying results, was injured by a machine gun bullet on July 18, 1918, at Chateau Thierry, the bullet perforating the leg just below the knee. Gas gangrene set in necessitating many incisions of the leg, followed by an osteomyelitis of the tibia. At the time of operation at this hospital, there were several healed scars on the anterior surface of the leg and a large scar twelve inches long and two inches wide, extending above the popliteal space downwards almost to the insertion of the tendo Achillis with contraction sufficient to prevent complete extension of the leg and so poorly

nourished that any effort at extension resulted in blanching of the scar. There was an ulcer 1 by 2½ inches in the centre of the scar which harbored the staphylococcus aureus organism and resisted all methods of sterilization. Numerous unsuccessful attempts had been made to heal this ulcer.

On August 6, 1920, under gas oxygen anæsthesia, several rectangular grafts were removed from the thigh of the same leg by a safety razor blade, turned inside out over the dental composition and sutured. A longitudinal incision was made on either side of the scar, the intervening tissue tunnelled beneath and the first graft inserted on the freshly cut area beneath the tunnel. Another tunnel was made below the granulation tissue of the ulcer and a second graft placed therein. A Thiersch graft was placed on the lower end of the ulcer and held by a slit through the scar tissue.

An incision was made across the scar tissue and a small inlay graft placed in that slit in such a manner that the raw surfaces of the graft were in contact with the raw surfaces of the cut. The first step was done with a view of lengthening the contracted scar tissue and relieving the tension on the ulcerated area, thereby improving its nutrition. The second step was made with the hope that the overlying granulation would hold the graft firmly in place until the epitheliazation could take place beneath, as all previous grafts on the unsterile surface of the ulcer had sloughed completely in two or three days. The whole procedure was done with the idea of allowing the rigid scar tissue to stretch further.

On August 14, 1920, nine days after operation, the roof of the tunnel above the dental composition was cut, and the dental composition removed, revealing epitheliazation of the floor without any sloughing of the graft. As was expected, there was some sloughing of the bridge of granulation tissue overlying the second graft, but these shreds of necrotic tissue were cut away, leaving a well epidermized floor beneath.

Case II.—This was one of marked contraction with limitation of motion due to extensive scar tissue formation between the left thumb and index finger following a severe electric burn of the third degree in the sulcus between the first and second metacarpus. Under gas anæsthesia, an oblong incision was made between the thumb and index finger which removed the entire thickness of the scar tissue in the area excised and permitted full abduction of the thumb. The skin surrounding the incision was undercut for about an eighth of an inch, and a composition mould was taken of the area. A full thickness graft was secured and prepared over the mould under tension by sutures and then put in place and the mould readjusted by the use of a hot compress to obtain accurate approximation with the denuded area and the adjacent margins of the skin and graft sutured together with fine catgut. A dry dressing with a cotton pad to afford elastic pressure was then applied and the hand immobilized with the thumb well abducted by splinting. Eight days later when the dressing was removed and the mould lifted out, it was found that the graft had taken in toto without any maceration or absorption and no tendency toward contraction between the thumb and index finger. Since that time he has been given a limited amount of physiotherapy and now has practically a complete return of full function in this thumb.

The accompanying illustrations (Figs. 1–5) show the condition before and after treatment and the various phases of the operation employed to effect a cure. Essentially the same technic was used in all the other cases reported here, modified only to the extent of meeting the various conditions confronting the operator.

Case III.—This case was also a burn followed by marked flexion of the right little finger due to the contraction of scar tissue resulting from the burn. An incision was made and all the scar tissue removed after it was determined that the

FIG. 1.—Typical deformity due to contracting scar-tissue.

FIG. 2.—Scar-tissue excised and denuded area ready for impression on modelling composition.

FIG. 3.—Various steps in the preparation of the mould and application of grafts to the same, inside out.

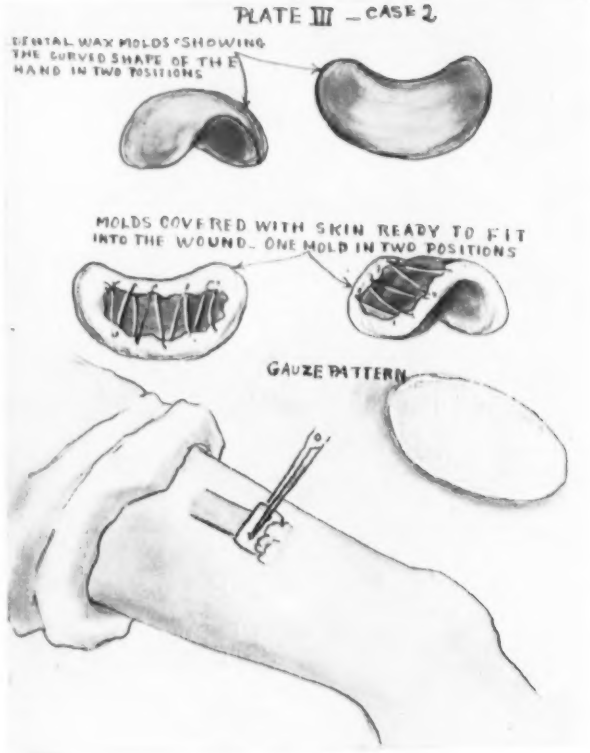
PLATE III - CASE 2
DENTAL WAX MOLDS SHOWING
THE CURVED SHAPE OF THE
HAND IN TWO POSITIONS
MOLDS COVERED WITH SKIN READY TO FIT
INTO THE WOUND. ONE MOLD IN TWO POSITIONS
GAUZE PATTERN

FIG. 4.—Graft in position showing method of suturing to hold both mould and graft in place during convalescence.

FIG. 5.—A typical end result following the application of this method.

FIG. 6.—Another typical result following the use of this method.

flexor tendon was not incorporated in the scar. Complete extension of the finger was then obtained. A mould was made of the excised area and the remainder of the operation was the same as given in Case II, with very satisfactory results.

Case IV.—Presented a chronic indolent ulcer on the outer surface of the left ankle over the external malleolus following a gunshot wound received in action on October 9, 1918. This case had the usual train of symptoms, including osteomyelitis with ankylosis of the joint and finally had reached a point where all efforts to heal the resulting ulcer had failed. The ulcerated area was excised, actively dakinized for a short period, and then, under gas anæsthesia, a mould was made of the area with composition, covered with a graft which was applied in the usual fashion and a good result obtained despite the very limited blood supply to that particular region.

Case V.—This patient presented the problem of epithelizing a narrow but deep granulating area in the lower end of the femur, the result of a high explosive shell injuring the right knee and incurred in action on October 8, 1918, followed subsequently by removal of the patella and extensive osteomyelitis of both the femur and tibia. On account of the wide area of the scar tissue surrounding this region, it was impossible to do a sliding operation or utilize a fat graft, so a mould was made of the cavity, a graft put around it in the usual fashion and the mould placed back into position. Despite the sharp curvature at the bottom of the cavity, the graft was entirely successful and still maintains its integrity notwithstanding active treatment to other lesions in this area.

Case VI.—This case was one of stricture of the anus due to contracture of scar tissue following extensive operations at other hospitals for epithelioma of the anal region involving the sphincters and subsequent plastic operations to overcome the condition. The anal opening would barely admit the tip of a small size probe and the patient was compelled to take large doses of mineral oil or saline to keep his stools in a liquid state so that they could be evacuated through this minute opening. Under gas anæsthesia, three radiating incisions were made outward from the anus and carried well downward through the scar tissue, one laterally on either side and one posteriorly in the median line. No incisions were made purposely in the median line anteriorly with the idea of using the anterior semicircular flap as a valve to assist in overcoming incontinence, which assumption subsequent events proved was well warranted. Softened dental composition was forced down into the three incisions, and impressions taken of them. Over these impressioned surfaces, grafts were sutured with fine catgut, and the moulds, with the superimposed grafts, placed in their respective incisions where they were held in position by a continuous row of sutures passed back and forth through the edges of the skin incisions in the anal margin across the blank surfaces of the moulds. A rubber tube of very small calibre was inserted in the anal canal to allow the expulsion of flatus and what little discharge might occur, and the patient constipated with opium. At the end of six days, the patient's bowels were opened, when it was found that the three incisions were lined with epithelium and that the anal orifice readily admitted the index finger. A subsequent plastic operation of a similar nature improved the condition to quite a degree so that the patient can now lead a fairly normal life.

Case VII.—This patient had a chronic ulcer of two years duration on the inner surface of the left foot, one of the sequelæ of a high explosive shell injury with extensive destruction of the tissues in this region. Several attempts had been made to close over this area, but with little success, and, when the patient came under observation, he presented an ulcer with an irregular outline 3½ inches long and ¾ to 1½ inches wide, running longitudinally beneath the inner malleolus. A preliminary operation was performed under gas anæsthesia which consisted of

complete excision of the granulating area and plastic diminution of the same followed by active dakinization. Twenty-six days later, the granulating wound was gently curetted and the general oozing controlled by Dakin compresses. A mould of softened dental composition was made of this very irregular cavity, covered with grafts and replaced. The undercut edges of the ulcer were sutured to the grafts. A firm and copious dressing was applied, and ten days later, when it was removed together with the mould of dental composition, the grafts were found to have been successful throughout their entire extent.

Case VIII.—This patient presented an oval ulcer, two inches long by one and three-quarters inches wide, on the inner border of the right foot following chronic osteomyelitis, the result of a gunshot injury to this region. For the past six months the ulcer in question had resisted all the ordinary methods of treatment, and consequently it was given a brief period of dakinization before this method of skin grafting was attempted. At the completion of this period, a mould was taken of the ulcerated area, in the usual manner, full thickness grafts sutured over the mould and the mould replaced. After the usual period, the sutures were cut, the mould released and a successful graft found beneath, as shown in Fig 6.

In addition to the cases mentioned above, there were two more belonging to this series, both of which presented ulcers resulting from X-ray burns, and, while they are not described in detail, the results obtained from the employment of this method of treatment were equally pleasing in each instance.

No particular originality is claimed for this method of skin-grafting, but the uniform success which has attended its use seemed to justify us in bringing it to the attention of the profession in the somewhat lengthy and explicit manner that we have, since the involved surface in each case was covered by an epithelium flexible and normal even to the extent that hair continued to grow when the graft implanted was thicker than that ordinarily used.

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THE SERUM TREATMENT OF ANTHRAX SEPTICÆMIA

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The experience of recent years indicates that we must relinquish certain conceptions that have been bequeathed to us concerning the therapy of anthrax in man. It is now known that the pustule of cutaneous anthrax frequently heals spontaneously if it is left to its own devices and not subjected to operation or cauterization, either of which may precipitate septicæmia. Anthrax septicæmia, on the other hand, is commonly regarded as a form of infection that is practically always fatal. As a matter of fact, of all the septicæmic diseases, it is the one with which we are best prepared to deal, namely, through the use of immune serum. The literature of medicine contains references to six cases of cutaneous anthrax with bacteriological proof of disseminated infection, in which recovery followed the intravenous use of anti-anthrax serum. A seventh is described in this paper. The same method of treatment would appear to be applicable to the septicæmic forms of pulmonary and intestinal anthrax, although I have not been able to find any reference to its employment in such cases.

In the first of two cases of anthrax septicæmia recorded by Bandi,[1] the patient was a cattleman, thirty years of age, who presented a pustule on the right forearm. The pustule was treated locally by means of the thermocautery, thirty-six hours after which the patient lapsed into coma, and bacteriological examination of the blood revealed innumerable anthrax bacilli. One hundred and fifty c.c. of anti-anthrax serum were injected intravenously, followed an hour later by an additional fifty c.c. The next day the condition of the pustule was noticeably improved; nevertheless it was thought advisable to administer another forty c.c. of serum. Bacteriological examination of the blood at this time failed to reveal anthrax bacilli; in other words, complete sterilization had been brought about within a period of forty-eight hours.

In a second case recorded by Bandi, the patient was a butcher and likewise presented an anthrax lesion on the forearm. Bacteriological examination showed anthrax bacilli to the number of about seven colonies to the cubic centimetre of blood. The patient was treated by a single intravenous injection of eighty c.c. of anti-anthrax serum and the subcutaneous injection of thirty c.c. Again, the blood became sterile within forty-eight hours, and recovery ensued.

In the case recorded by Graham and Detweiler,[2] the patient was a tanner, thirty-six years of age, with an anthrax pustule on the left side of the neck. Forty-eight hours after infection, forty c.c. of anti-anthrax serum were given subcutaneously and the tissues surrounding the sloughing area were injected

with forty per cent. alcohol. The next day the lesion was excised, after which the patient became worse, and forty-eight hours later bacteriological examination of the blood showed the presence of anthrax bacilli. The patient was given one hundred c.c. of chloramin-T, together with eighty c.c. of anti-anthrax serum intravenously. The blood became sterile in thirty hours and remained so in spite of the fact that no further specific treatment was used.

In the case of Baduel and Daddi,[3] the patient was a woman, thirty years of age, who presented an anthrax pustule on the right forearm. At the moment of admission to the hospital a blood culture was made and, at the end of twenty-four hours, revealed numbers of colonies of anthrax bacilli, an emulsion of which, injected into a guinea-pig, produced death in thirty-six hours with the typical lesions of anthrax. In the course of five days the patient was given a total of two hundred c.c. of anti-anthrax serum intravenously, at the end of which time the blood culture was sterile. The patient made an uninterrupted recovery.

In a case reported by Bissel,[4] the patient was a longshoreman, fifty-four years of age, with a pustule on the right side of the neck. A blood culture taken twelve hours after admission to the hospital was positive. Intravenous serum therapy was commenced at the same time that the blood culture was taken and, during a period of forty-eight hours, one hundred and fifty c.c. of serum were injected intravenously in fifty c.c. doses. At the end of this time the blood culture was negative and the patient recovered.

In Becker's case,[5] there was an anthrax pustule on the left eyelid. Blood cultures were positive. Treatment was commenced late because no serum was immediately available and, although the patient showed severe constitutional symptoms with high fever, the intravenous injection of serum was followed by sterilization of the blood and recovery. The amount of serum used and its method of injection are not given.

BELLEVUE HOSPITAL CASE

A man, aged thirty-five, was recently admitted to the service of Dr. William C. Lusk at Bellevue Hospital on a Tuesday evening with an anthrax pustule on the left side of the neck. The central eschar measured one and one-half by one cm. It was slightly depressed and was surrounded by a broad elevated rim that was covered by innumerable minute silvery vesicles. The tissues in the vicinity were swollen in an upward direction as far as the level of the external auditory meatus and downward to a point slightly below the left clavicle. At the time of the patient's admission to the hospital and throughout the length of his stay, he was mentally clear and showed no apprehension beyond that of a natural desire to be informed of the nature of his illness and the probable chances of death. The patient stated that on the Saturday before he had used a new shaving brush for which he had paid fifty cents. He had no recollection of having cut himself in shaving nor was he aware that his skin immediately previously had been the seat of an excoriation of

any sort. Within forty-eight hours, a small itching papule appeared on the left side of the neck. The papule rapidly enlarged and broke down, and the tissues in the vicinity commenced to swell and soon reached such proportions that he consulted a physician, Dr. F. F. Schirck, who sent him to Bellevue Hospital with the diagnosis of probable anthrax.

At the moment of the patient's admission, smears from the pustule showed numbers of gram-positive bacilli having the morphological characteristics of b. anthracis. Agar plates inoculated directly from the pustule revealed, after twelve hours' incubation, numbers of colonies presenting the typical doll's hair arrangement of the anthrax bacillus. Blood withdrawn from the median basilic vein and inoculated into three agar plates yielded, after twelve hours' incubation, an average of forty anthrax colonies to each plate. Three bouillon cultures were similarly positive. An emulsion of one of the colonies from a blood agar plate was injected into the subcutaneous tissues of the abdominal wall of a guinea-pig and in forty-eight hours the pig died. Necropsy showed gelatinous infiltration of the superficial structures of the thoracic and abdominal walls with areas of hemorrhage and necrosis in the track of the needle, and anthrax bacilli were grown in pure culture from the heart's blood. A second guinea-pig, inoculated with a few drops of one of the broth cultures, came down in forty-eight hours with practically identical changes, and anthrax bacilli were likewise cultivated from the heart.

The shaving brush that the patient had used was examined bacteriologically. Numerous colonies of anthrax bacilli were grown from the bristles, which consisted of horse-hair. One of my assistants, Dr. D. W. Cady, went to the shop from which the patient stated that he had purchased the brush, and the proprietor presented him with the entire remaining supply, nine in number. These were submitted to bacteriological examination, and virulent anthrax bacilli were cultivated from three of them and from the dust of the paste-board box in which they were kept, the virulence of each strain being determined by guinea-pig inoculation.

Immediately upon entering the hospital, the patient was placed in bed and fifteen c.c. of anti-anthrax serum were injected at several points under the skin in close proximity to the crater of the pustule as advocated by Regan. The next morning, when the blood cultures were found to contain anthrax bacilli, two hundred c.c. of anti-anthrax serum were injected intravenously. The dose was repeated at four-hour intervals on three occasions, making a total of eight hundred c.c. of serum to be administered within the first sixteen hours of treatment. The following morning blood cultures were made on six agar plates and, twenty-four hours later, every one of the plates was sterile. In the meanwhile, pending the result of the blood examination, the patient received an additional three hundred c.c. of serum intravenously in doses of one hundred c.c. every four hours, thus making a total of eleven hundred c.c. in forty hours' time. On the sixth day of the disease, examination of smears from the pustule failed to reveal the presence of

anthrax bacilli, and local treatment was discontinued. The patient was discharged from the hospital on the ninth day cured.

COMMENT.—This is the only occasion that I have had to treat a case of anthrax septicæmia, my previous opportunities having been limited to the serum treatment of some thirty odd cases of cutaneous anthrax without generalized infection. In order to meet a desperate situation, I deemed it best to employ large amounts of serum. Doses such as were used are recommended by no less an authority than Doctor Eichorn.[8] Nevertheless, as a result of this experience and in reviewing the work of others who have been called on to act in similar circumstances, it seems to me that a preliminary intravenous dose of one hundred and fifty or two hundred c.c. of serum, followed by forty c.c. at four or eight-hour intervals, would probably suffice, and, in future, this, I think, is the plan that I should pursue as offering an equally reasonable chance of success. If limited to a given amount of serum, the first or "sterilizing" dose is the one on which I should be inclined to place the greatest degree of reliance. In spite of the favorable results reported by others from the use of relatively small doses of serum, it would appear that to depend upon the lesser quantities as a routine measure is sooner or later to court disaster—in dealing with a disease so treacherous as anthrax, it is well to leave a wide margin of safety.

The localized cutaneous lesion of anthrax, when fully developed, presents an appearance scarcely to be mistaken for that of any other disease. It is an ugly affair to look upon, painless, and possessed of vicious potentialities. It is characterized by a dirty brownish eschar, scattered over and surrounding which are numbers of pinhead-sized silvery vesicles, the whole set in the midst of an area of swelling which may remain within moderate bounds or assume such enormous proportions that, when the pustule is situated on the face or neck, the eyelids are closed and the tissues of the upper part of the chest are thrown into large œdematous folds. The swelling is due to the presence of a semi-gelatinous substance—anthraco-mucin—which is inimical to the growth of the anthrax bacillus and which represents, therefore, a defense reaction on the part of the tissues, and should be left alone.

While the anthrax pustule itself offers a forbidding aspect, the appearance of the patient, on the contrary, is apt to give one the impression of extraordinary tranquillity, *even though his blood may be swarming with anthrax bacilli.* For this reason, the only really justifiable attitude for the physician to assume is that every *anthrax pustule from the outset is attended by the dissemination of bacilli in the blood,* and to treat the patient on this assumption until the result of the blood culture is known. It is, at best, an error on the safe side. In artificial culture media the anthrax bacillus grows with facility and positive cultures may be sometimes secured within twelve hours, always within twenty-four hours. A negative result in twelve hours should never be accepted; a negative result in twenty-four hours need never be rejected.

In the meanwhile, the administration of serum is a harmless procedure and, in the event that anthrax septicæmia exists, valuable time will have been saved.

CONCLUSIONS

1. Every anthrax lesion of the skin or elsewhere should be tentatively regarded as attended by generalized infection until the result of the blood culture proves the contrary.

2. In no circumstances is it justifiable to tamper with the anthrax pustule—incision, excision, cauterization, or similar treatment is dangerous, and may be followed by anthrax septicæmia. The only permissible form of local treatment consists in the injection at the periphery of the pustule of broken doses of anti-anthrax serum at intervals of four or six hours, each injection not to exceed a total of ten or fifteen c.c. Failing this, it is better to cover the lesion with a bit of sterile gauze to collect the secretions, but otherwise to leave it absolutely alone.

3. The most dependable routine method in the treatment of the anthrax pustule is, first, to isolate it within a barrier of anti-anthrax serum subcutaneously injected every four hours; second, to inject intravenously, at once, a sterilizing dose of one hundred and fifty or two hundred c.c. of serum, and, third, to supplement this by the intravenous injection of forty c.c. every four or eight hours. If the blood culture is negative at the end of twenty-four hours, the intravenous use of serum may be discontinued, the local injections being kept up until the pustule is free from bacilli, or at least until involution forms occur in the stained films. In anthrax septicæmia, the liberal use of anti-anthrax serum intravenously, if commenced in time, is capable in many instances of sterilizing the blood with astonishing rapidity, and, in septicæmic cases, the routine just outlined may be followed until the blood cultures are negative.

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PERITONITIS AS A COMPLICATION OF PROSTATECTOMY

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Infections in relation to prostatectomy are of major importance and have well merited the attention given them in attaining the present satisfactory status of the operation. The average prostatic is usually a poor subject to withstand even a low grade infection, which is often supplemental to an already existing one. The most important infections are suppuration in the prevesical space and pyelonephritis. The former has been uniformly quite well handled by careful attention to drainage of this space. Pyelonephritis is often already present, but the occurrence of acute exacerbations may be minimized by gradual rather than abrupt relief of the back pressure produced by the obstruction and by giving plenty of fluids after drainage has been established.

Among the rarer complications of an infectious nature are phlebitis and epididymitis. It is highly probable that phlebitis with resulting emboli in the lungs is not so rare as we have believed it to be. Cabot recently demonstrated a case of osteomyelitis of the pubic bone following prostatectomy and stated that he had seen others. Peritonitis, however, is rarely, mentioned as a complication of prostatectomy. In fact, most surgeons have considered the accidental opening of the peritoneal cavity during prostatectomy to be devoid of danger. Judd,[1] in 1913, made the statement that he had opened the peritoneum unintentionally on seven occasions with no ill effects. Pilcher[2] says: "This accident has occurred to the writer, but no untoward symptoms follow the injury if the wound is immediately closed." I, too, am able to state that this accident has happened to me several times and would formerly have agreed that it apparently was never followed by infection of the peritoneal cavity. In a casual survey of prostatic literature of the past several years no case of peritonitis following this accident has been found recorded.* That it may occur is demonstrated by the following case:

> H. W. C., aged fifty-seven, farmer, was first seen January 27, 1920, and presented the usual symptoms of prostatic obstruction. Rectal examination revealed a moderately enlarged prostate. The patient was catheterized and three ounces of residual urine obtained. The blood-pressure was 150–90. Phenolsulphonephthalein test, first hour twenty

* An article has since been found by Deaver (Arch. Surg., March, 1921) giving the cause of death in thirty-six cases at the Lankenau Hospital. Three of these deaths were due to peritonitis.

per cent.; second hour five per cent. Cystoscopic examination was attempted the next day but nothing could be distinguished on account of the bleeding produced by the manipulations. Three days later a suprapubic cystostomy was done under local anæsthesia. The prostate showed moderate enlargement with a marked hypertrophy of the median lobe. After allowing the bladder to drain for three weeks it was decided to proceed with the second stage. The operation was begun as usual with local anæsthesia. While enlarging the suprapubic opening the peritoneal cavity was opened accidentally. It was closed in the usual manner. A small amount of ether was given and the prostate shelled out. The prostatic bed was packed with gauze, a drainage tube placed in the bladder, and the wound closed. The pathological diagnosis was adenoma of the prostate. The following day the patient's condition was good. On the second day, however, the patient began to have some abdominal distress and distention which increased progressively until death occurred on the fourth day with all the usual signs of an extensive acute peritonitis.

Permission for a partial autopsy was obtained. A very extensive peritonitis was found. The intestines were distended. There was a plastic exudate everywhere extending up to the region of the stomach. In the left lower abdomen, walled off by the sigmoid, was an abscess holding about one ounce of pus. The liver was somewhat larger than normal and from gross appearance there was evidently a beginning cirrhosis. The spleen was twice the normal size and an old encapsulated abscess the size of a hen's egg was found in it. The wall of the abscess was calcareous. The spleen itself was softer than normal. The kidneys and ureters were negative. The bladder wall was covered over about one-third of its surface by a diphtheroid membrane. The cause of death was an acute generalized peritonitis due probably to soiling of the peritoneum following its accidental opening in enlarging the suprapubic wound. It is to be regretted that no cultures were made and we are unable to report on the bacteriology of the peritonitis.

Although this occurrence must be extremely rare, it would seem well to bear it in mind. Measures directed towards its prevention would be (1) those aiming to prevent opening of the peritoneum and (2) those aiming to prevent soiling of the wound by bladder contents. If the operation is done by the two-stage method, there is probably more danger of the accident occurring at the time of the second stage.

The technic of the preliminary cystostomy varies greatly with different operators. The majority probably prefer irrigation and distention of the bladder with some sterile fluid. The peritoneal reflection is, of course, carried higher up on the bladder and is more easily avoided. After exposure and recognition of the bladder the fluid may then be drained off through a catheter in the urethra which has been allowed to remain in place, or by direct trocar puncture of the bladder. Wound soiling is readily avoided by either of these methods. Judd prefers a relatively empty bladder and sponges

out any small amount of urine that may be present. This method is quite satisfactory and it is hardly more difficult technically than to open a distended bladder. We do not have our patients catheterized before going to the operating room and the bladder usually contains a moderate amount of urine. A small opening is made in the bladder and the knife followed in by a finely perforated tubular aspirator connected to an electric suction apparatus and the bladder is readily emptied without wound soiling. We have had no serious infections of the space of Retzius using this technic. The space is always drained in the usual manner. Whatever method is used, one essential factor in the prevention of infections, whether of the space of Retzius or of the peritoneal cavity, is to prevent flooding of the wound with bladder contents, even if it has been irrigated and filled with some sterile solution.

It is in enlarging the bladder opening at the second stage that the greatest danger of opening the peritoneum presents. If the prostate is shelled out by touch without exposing it there is little danger of this accident, as a very small incision extending downward from the old sinus is usually all that is necessary. However, many men prefer the method of exposing the prostate by a larger bladder opening and the use of retractors. The operative field may be clearly viewed, which is often a decided advantage, and certainly comes within the range of good surgical principles. The bladder opening must be kept well away from the trigone and for this reason it is well to open the bladder as high up toward the fundus as is possible at the first stage, even if the primary opening into the bladder must be closed and a second one made. When this is done a generous bladder incision may be made at the second stage without cutting upwards from the old sinus and at the same time without encroaching on the trigone. It has been repeatedly pointed out that it is unsafe to make an incision upwards from the site of the fistula, and Deaver has recently made the flat statement that the opening should never be enlarged upwards.

When the peritoneum is opened accidentally it is sutured with catgut. But when such is done, and even in cases where there has been no peritoneal injury, it is well to look at the peritoneum after shelling out the prostate, if in the field, as it may be torn during the manipulation of enucleation.

Recently we have been dissecting the peritoneal fold well off the fundus of the bladder at the first stage and anchoring it there with one or two fine catgut sutures. Schmidt puts anchor sutures at the upper angle of the bladder incision placed as high as possible and then passes them through muscle, fascia and skin, thus preventing the peritoneal fold from herniating downward, especially as he does not separate the various layers laterally in exposing the bladder. The method of anchoring the fold back on the bladder has been done in too few cases to express an opinion as to its utility. The method described by Schmidt, however, would seem to be quite satisfactory. In dealing with badly infected bladders, Williams[8] does a "three-stage" operation. The cystostomy is done in two stages. The first procedure

involves only exposing the bladder and placing guy sutures. He then waits four to seven days to permit walling off of the space of Retzius and paravesical tissues. The bladder is then opened and drained. The procedure is analogous to the usual one in doing a colostomy and would seem to be a very efficient method of handling badly infected bladders.

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SCIATIC HERNIA *

REPORT OF A CASE COMPLICATED WITH MYXOMATOUS TUMOR OF THE SCROTUM

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Since the publication of the classical article of Garré [1] in 1892, and that of A. Schwab [2] in the same year, this type of hernia has been recognized as one with three forms " . . . which pass out both posterior sciatic notches, the greater sciatic notch and the lesser sciatic notch. Anatomically, it is possible for a pushing out of the peritoneum in three places. The greater ischiatic notch is covered by the pyriformis muscle which has a small opening or split both at its upper and lower borders. The superior gluteal artery passes out regularly through the upper opening accompanied by a small similar named nerve, while through the lower opening pass the internal pudic artery and commonly also the principal branch of the ischiaticus (Fig. 1.) Hernias can occur through both openings. The third place in which a hernia can occur is through the smaller ischiatic fossa. In all cases, through whichever opening the hernia passes, it must always have the great or posterior sacrosciatic ligament (ligamentum tuberoso-sacrum) under it. After passing through one of these openings it makes its appearance in the gluteal fold, under the border of the gluteus maximus muscle. To differentiate a sciatic hernia from a perineal hernia the examining finger can always feel the sacrosciatic ligament above the hernial opening in a perineal hernia; below, in a sciatic form." Garré compares the great sacrosciatic ligament, in this differentiation, with Poupart's ligament in distinguishing between femoral and inguinal hernia. Although it is generally credited to Sir Astley Cooper [3] as having been the first surgeon to describe a case of ischiatic hernia observed in 1800 (Figs. 2 and 3), a further examination of the literature brings out the fact that an earlier case was reported in 1750 by a German author of the name of Papen, in a letter addressed to Haller. We learn from Schwab, whose paper represents the most exhaustive study of the subject of ischiatic hernia in the literature, as far as I have been able to study the references, that the etiology of ischiatic hernia is obscure—probably chiefly because of the rarity of its occurrence. There is a marked predominance in the female sex in proportion to two cases in women to one case in men. This greater frequency is explained by the fact that the ischiatic notch is slightly larger, as well as that the sacrosciatic ligament in women is of greater length and laxity. The hernia occurs more frequently on the right side than on the left, having been observed there ten times out of fourteen cases. One particularly interesting case of a woman, reported by Crosslé,[4] has a clear history as to its etiology, it having developed while the woman was " in the act of stooping

* Read before the Western Surgical Association, December 9, 1921.

and assisting to lift a heavy iron plow into a cart; she became suddenly conscious that something had given way in a situation deeply seated," where she later discovered a small tumor about the size of a pigeon's egg, situated on the margin of the gluteal fold on the same side. This tumor gradually increased in size until when it was examined by Crosslé it had reached the size of a well-formed fœtal head at full period. A drawing (Fig. 4) made of this tumor and published in the reports of the Dublin Pathological Society, in every respect had the appearing characteristics of an ischiatic hernia, and has served as an illustration of ischiatic hernia, in text-book articles on the subject since Crosslé made his report.

Ischiatic hernia is congenital or acquired, never congenital in women, and is most frequently caused in women as a result of the pressure and trauma of labor. The hernia can occur on either side—right or left—and can contain intestine and omentum and any viscus or organ sufficiently movable to reach and pass out of the pelvic cavity. Of the cases reported by Garré, three contained the right ovary and a loop of intestine. Von Eiselsberg [8] reports a case of cut-off (abgeschnürter) intestine as a content of an ischiatic hernia, operated May 19, 1904. The patient—a child—was a boy one and a half years old. There was a swelling about egg-sized, in the left sacral region. Three days before taking the boy to the Clinic the swelling had spontaneously enlarged. The tumor was diagnosed as a lipoma, which it was in part. Operation disclosed the swelling to be a lipoma below, and an ischiatic hernia above, involving the foramen ischiaticum majus. The contents of the sac were a convolution of intestine having two blind, sausage-shaped ends (Fig. 5), and only communicated with the peritoneal cavity by a little finger-sized mesentery pedicle. The pedicle was ligated and divided, and the intestinal coil removed. (Fig. 6.) The patient recovered.

The hernia may be very small and not perceptible to sight, or it may be large. It may vary in size from that of a chicken's egg to that of a grape-fruit. Such a tumor may be mistaken for a teratoma, lipoma, or spina bifida.

Out of the seventeen cases reported up to the time of the articles by Garré and Schwab in 1892, eleven of them can be positively stated as being true ischiatic hernia; since that time a few isolated cases have been reported by British and Continental surgeons, and the sum total to-day equals about twenty-five. As far as the available literature at my disposal is concerned, I have been unable to discover a single case reported by an American surgeon. Doubtless, cases have been observed and possibly reported.

From the comparatively small number of cases which have been reported, it appears that these hernias, unless they produce symptoms of strangulation, had best be let alone. When from the size of the hernia the symptoms warrant interference, an attempt may be made to close the hernial opening from without. In the presence of strangulation a combined operation (extra- and intra-pelvic) should be performed, and the case dealt with on general surgical principles. M. Köppl has noted nine cases of strangulation out of the twenty-

five cases published in the literature. Lejars[6] recommends as a technic for operation, first, that an excellent light must be provided because of the deep situation of the hernial ring, and the necessity of avoiding the wounding of important blood-vessels, which might lead to a fatal termination, and which the methods of exposure, never quite satisfactory, might not suffice to prevent. The incision should be made in a downward and outward direction because the gluteal artery usually crosses the superior border of the sac; this is true only in a certain number of cases, but one can never know in advance the exact type of the hernia. A large incision should be made through the gluteus maximus, and its two flaps retracted in order to expose the subjacent region. The incision should be made obliquely, following the direction of the muscular fibres, from the posterior inferior spine of the ileum to the lower posterior border of the great trochanter. It is the same incision as that employed for the ligature of the gluteal artery, only it is made one or two finger-breadths lower. Under the gluteus maximus the sac must be carefully isolated before opening it, and the operator must endeavor to recognize by feeling with his finger, above, the osseous arch of the great sacrosciatic notch; below, the superior border of the pyramidalis muscle, which obliquely crosses this deeply exposed region. The sac is then incised and the finger, passing up the neck, enlarges the opening by making gentle pressure downwards and outwards. In any necessary further enlargement of the hernial opening great care must be taken not to injure any of the neighboring arteries. The contents and the sac should be dealt with as in other hernias, and an attempt made to close the opening with the available tissues in the most practical way possible. Should gangrene have already developed, after establishing external drainage the operation should be completed, most safely probably at a later period, by the abdominal route, in the same fashion as it would be carried out in a similar complication of one of the ordinary hernias.

The subject of my observation (Fig. 7) was a man, age thirty-five, iron-worker, white. Entered my service in the University of Nebraska Hospital (surgical number 6213), June 17, 1921, for the removal of a large heavy scrotal tumor reaching well towards the knees. This had had its beginning three years back, growing slowly at first, of late, rapidly. Three years previously the patient had been operated upon for an appendiceal abscess—the appendix was not removed. Two months following this operation the patient noticed some bulging in the right gluteal fold; later, an unsuccessful attempt was made to remove the appendix, and a scar of an incision over the bulging, replaceable swelling in the right gluteal fold, indicated that an attempt at exploration had been made, but the man was ignorant as to this. The patient had a right inguinal hernia near the middle line which was the incision used for the drainage of the appendiceal abscess, and a palpable, intra-abdominal tumor could be felt suprapubically. The swelling in the right gluteal fold had increased considerably in size in the last year. The past and family history of this man was negative, except for the fact that he had been given to the excessive use of alcoholic drinks. All physical findings were negative except as above stated. Wassermann and other laboratory findings were negative. The large, massive scrotum was larger on the right side than on the left. The testicles were in their

FIG. 1.—Showing a hernia passing out at the upper border of the pyriformis muscle, and its relationship to the gluteal artery and nerve.

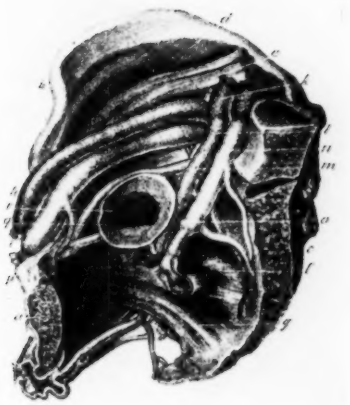

FIG. 2.—(Cooper) Internal view of ischiatic hernia. (*a*) Section of the pubis; (*b*) Spinous process of the ilium; (*c*) Sacrum; (*d*) Iliacus internus muscle; (*e*) Psoas muscle; (*f*) Pyriformis muscle; (*g*) Coccygeus muscle; (*h*) Termination of the external iliac artery in the crural; (*i*) Beginning of the crural vein; (*k*) Trunk of the common iliac artery; (*e*) Internal iliac artery; (*m*) Obturator artery, which may be traced before the sac as far as the obturator foramen; (*n*) Internal iliac vein; (*o*) Obturator vein passing behind the hernia to the obturator foramen; from which another vein (*p*) is seen passing into the iliac vein; (*q*) Hernial sac; (*r*) Its orifice.

FIG. 3.—(Cooper) Posterior view of ischiatic hernia. (*a*) Anterior superior spinous process of the ilium; (*b*) Crista of the ilium; (*c*) Sacrum; (*d*) Os coccygis; (*e*) One of the sacro sciatic ligaments; (*g*) Acetabulum; (*g. g.*) Sciatic nerve; (*h*) Gluteral artery; (*i*) Ischiatic hernia sac situated between the artery and nerve.

FIG. 4.—Drawing of case reported by Crosslé.

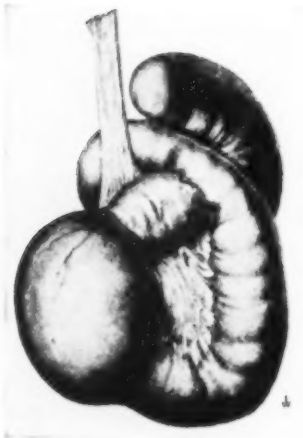

FIG. 5.—(von Eiselsberg)

FIG. 6.—Probable method of restoration of intestinal current. (von Eiselsberg.)

FIG. 7.—The scrotal tumor—myxoma.

FIG. 8.—Right ischiatic hernia. Myxomatous tumor of scrotum.

FIG. 9.—Showing appearance after removal of scrotal tumor.

FIG. 10.—Showing perineal tumor which appeared post-operatively.

normal position and the tunicæ vaginales were evidently not involved. The gluteal tumor, the size of a medium adult fist, presenting at the gluteal fold, disappeared upon the patient's lying down with the pelvis elevated; it was resonant upon percussion; gave an impulse upon coughing; gurgling could be felt; it was replaceable and passed within the pelvis above the great sacrosciatic ligament. In other words, it had all the characteristic phenomena of a true ischiatic hernia. As this hernia was making no special disturbance, and as it was easily reduced, operation was not deemed advisable because of the other complicating conditions, referable to the scrotal tumor. The scrotal tumor had, to my mind, the external and physical characteristics which we recognize as elephantiasis.

On the twelfth day after admission into the hospital, under ether narcosis, the patient was operated upon for the removal of the scrotal tumor, which was heavy and quite vascular, flaps being formed as deemed best to restore the parts to an approximately normal state. (Fig. 9.) An unusual condition was discovered in the carrying out of this technic, which was not easy; the tumor had a pedicle of about half the size of the ordinary man's wrist, which passed up in the perineum between the rectum and the urethra and was a part of the pelvic tumor, which was palpable supra-pubically, extending upwards about one-quarter of the way towards the umbilicus. The gross tissues of the tumor, which was heavy and had many blood-vessels coursing through, had much the appearance of the thick, whitish, watery tissues of the scrotum, seen upon incision into it in instances of extravasation of urine. The wounds healed kindly and X-ray treatments were instituted for their hoped-for influence upon the remaining portions of the tumor in the pelvis. The patient was discharged from the hospital July 23, 1921, with orders to report as directed, for observations and X-ray treatment. The man renewed his alcoholic habits and was unreliable and neglectful in carrying out instructions, and, being interested, I had him practically kidnapped when drunk and brought to the hospital for further treatment, as it had been ascertained that the tumor, both perineal (Fig. 10) and pelvic, was enlarging very noticeably. He reëntered the hospital September 4, 1921, and it was not until September 19th that he had sufficiently recovered from the effects of his alcoholic poisoning to justify an operative procedure under ether. On this day I removed a considerable mass of the new growth which had mounted upwards from the perineum towards the right inguinal ring. The incisions employed gave me an opportunity to determine that the pelvic growth was a retroperitoneal one.

The hospital pathologist, Doctor J. J. Keegan, reports as follows:

"In gross the tumor consisted of numerous encapsulated nodules, two to ten centimetres in diameter, of moist, translucent, fairly soft tissue. The form was preserved on section. Microscopically this tissue consisted of widely separated spindle and star-shaped cells with processes anastomosing or disappearing in the matrix. These cells were more numerous in the region of the capsule and about blood-vessels. There were varying numbers of blood-vessels with loose mesh adventitia. The matrix of the tumor consisted, in formalin fixed tissue, of a finely fibrillary structure and clear interspaces. A diagnosis of myxoma was made in this case on account of its distinct nodular tumor characteristics, its tendency to recur after operation, and the loose-mesh embryonic connective-tissue characteristic on section."

The particular interest in this scrotal tumor consists in the fact that its growth downwards, and upwards into the pelvis, follows the embryonic development of the scrotum itself. The myxomatous character of the tumor confirms its mesodermal origin. The scrotum is mesodermal in origin, and like the abdominal wall differentiates into the same layers. The best description of the embryological development of the scrotum with which I am familiar will be found in the Treatise on

Surgery[7] by le Dentu and Pierre Delbet. The formation of the scrotum is independent of the testicular development and migration. "At the beginning of embryonic life the terminal portion of the intestine, the allantois, the canal of Wolff, and the canal of Müller, open into a common cavity which bears the name of cloaca. Towards the second month a mesodermic bud (or shoot) is detached from the superior wall of this cavity, which, under the name of perineal spur descends vertically and forms a transverse partition; this divides the cloaca into two cells, henceforth separate and independent. The posterior cell is called the anus; it is in its interior that the intestine ends. The anterior cell bears the name of urogenital sinus." From this, later, develop the urethra, and in the female the labia of the vulva, in the male the scrotum.

I now have this patient, because of his habits, under legal restraint, and under my control, and am having the X-ray treatment carried out systematically, and hope to be able to report at some future time the disappearance of the pelvic, myxomatous tumor, which I am advised by radiologists should be considered as a tumor favorable to such treatment because of its unlikelihood of metastasizing.

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SPONTANEOUS LATERAL VENTRAL HERNIA*

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of Philadelphia

In presenting this study it is not my intention to claim any originality. The subject of hernia in all its forms has been reviewed repeatedly. Hernia in its many varieties forms a large part of early and modern surgical literature. Gradually the classification into types offered particular subjects for the investigators. Little remains now to be added. Lateral ventral hernia, spontaneous or traumatic, has been written about frequently and fully. Yet the occurrence of a spontaneous ventral hernia offers interest, for because of its rarity it is frequently not diagnosed before strangulation occurs, or until exploratory laparotomy reveals it to be the incipient factor in the production of a series of aggravating symptoms.

Accordingly then it shall be my purpose to report one more case of such a hernia, to review briefly the subject and to point out a few diagnostic difficulties which have been little considered and less admitted.

Definition.—The definition of La Chausse is that "ventral hernia is any hernia except a femoral, inguinal or umbilical." He included parainguinal, medial inguinal and supravesical hernia in his classification, and added, "No certain locus can be assigned to them." Mollière wrote that "nearly always these herniæ occur in the linea alba, or a little outside this cicatrix, or in the semilunar line of Spiegel, and on a level with a line from the anterior superior spine of the ilium to the umbilicus." Obviously any hernia of the anterior abdominal wall would be a true ventral hernia. Excluding umbilical, lumbar, and post-operative or traumatic types, we may define spontaneous ventral hernia as one which appears at an abnormal opening in the abdominal wall, apparently without explicable reason, but usually presenting in or near the linea alba, or the semilunar line of Spiegel. Our present interest, however, being in lateral ventral hernia, this discussion will be limited to that type of hernia which occurs near the lateral margins of the recti muscles, in that aponeurotic structure commonly known as the semilunar line of Spiegel. More strictly speaking, however, this is not a mere line, for repeated dissections have proved that the blending of muscle layers and ensuing aponeurotic sheaths may not be accomplished through a sudden sharp line of demarcation, and that consequently the so-called Spiegel line may be a fairly broad structure extending a varying distance from the lateral rectus margin. It is then, in this space, that such hernias as we shall discuss occur.

Report of Case.—K. H., widow, age forty-five, was admitted to the Episcopal Hospital, August 25, 1921, in Doctor Ashhurst's service. Family history was negative. She had had the ordinary diseases of

* Read by invitation at a meeting of the Philadelphia Academy of Surgery, February 6, 1922.

childhood and typhoid fever at twenty-four years of age. She had had four children. The menstrual history was negative. Her general health had been always good.

Chief Complaint.—Lump in right side. The patient noticed a small lump in lower right side two years ago soon after going to work in a mill where she had to lift heavy loads, sometimes seventy pounds, two or three times a day. The first time she noticed the lump she felt a "click." A month or so later she noticed a lump about the size of a small marble. This grew larger gradually, and became slightly painful. Several times, at various intervals, she noticed that the lump appeared, and she found that upon lying down it disappeared especially when a hot bag was applied to the region. Often the lump was sore to touch and she would be compelled to lie with her leg drawn up. Pain would be cramp-like, but seldom occasioned nausea or vomiting. Usually the lump would be reduced gradually, or as she put it, "by degrees." The site of this swelling was pointed out as being a little above and external to the inguinal region. It was a little larger on admission than when first noticed. It became painful when she exerted herself or sometimes when she would stand up. She had never had much difficulty in replacing it. Sometimes an interval of two weeks occurred without her noticing it. She had suffered constipation, indigestion, belching of gas and occasional vomiting spells for an indefinite time. Other systems were irrelevant.

Physical Examination.—The patient is a well-developed, well-nourished, but not obese, white adult female, forty-five years of age. The head, neck, chest and heart are negative. The abdomen is not pendulous. There are striæ over the lower wall (from previous pregnancies). There are no scars, no areas of tenderness or rigidity. The patient points out the site of the lump just above and to the outer side of the right inguinal canal. Repeated examination by manipulation, palpation, and observation failed to disclose any abnormality, the "lump" of which she complained remaining undiscovered as well as any depression or orifice in this region. The genitalia and extremities were negative. Basing the diagnosis strictly upon the patient's history, a diagnosis of hernia was made, though no classification was mentioned.

Operation.—August 30, 1921. (Doctor Ashhurst and Doctor Holloway.) Incision fifteen cm. long parallel to the fibres of the external oblique above and below the right anterior superior spine of the ilium, exposing the external oblique. The aponeurosis of the external oblique was opened, and beneath it a hernial sac was found the size of a hen's egg, covered with preperitoneal fat. The sac was dissected free, from an opening in the internal oblique and transversalis muscles; which opening was opposite the anterior superior spine, and at least eight cm. above and to the outer side of the internal ring. Sac opened at its fundus, and excised around its origin from parietal peritoneum. Appendix removed. Meso-appendix sutured for bleeding, stump ligated and buried. Wound then closed in layers with continuous chromic for the peritoneum, interrupted chromic for internal oblique

and transversalis as one layer, and continuous chromic for the external oblique and for the skin.

The patient made an uneventful recovery and was discharged sixteen days later. Six weeks after operation the patient reported to me for examination. She was in excellent health and spirits. Her symptoms of indigestion, belching and vomiting had disappeared. She no longer had any attacks of pain or abdominal discomfort. Her general mental attitude was greatly improved.

Historical.—History has it that Hippocrates, Avicenna and Galen were familiar with ventral hernia, but the early observers seem to have known only those traumatic in origin. Le Dran (1742) gave the first clear discussion of the subject in his *Traité des Operations de Chirurgie.* La Chausse, who gave the first accurate contribution upon the subject of ventral hernia (1746), states that Celsus devoted an entire chapter to the subject but confused it with umbilical hernia. It remained for Dionis, Garangeot and Heister (1738) to clearly differentiate them. La Chausse distinguished three types of ventral herniæ: (1) Those in the linea alba above and below the navel; (2) those in the lateral epigastric regions; and (3) those in the lateral hypogastric regions due to separations of the fibres of the oblique or transversalis muscles. In his studies of the last type, however, he considered those herniæ of traumatic origin only. In 1746 Klinklosch pointed out "Spiegel line herniæ," but in his study he included all types of abdominal hernia. In 1804 Cooper added much to the subject.

Little advance in the study of this particular type of hernia was made then until the latter part of the nineteenth century, and interest in cases assumed only the proportion of curiosity. In 1877 D. Mollière presented a case consecutive with phlegmon and this is accordingly ranked as traumatic in origin. In 1878 Terrier produced his important work upon ventral hernia and in 1879 Mackrocki assembled eighty-six cases of lateral abdominal herniæ, pointing out favorite sites as vascular exits added by fat. In 1881 Ferrand added his own case to his thesis.

The most elaborate studies seem to have been made within a comparatively recent time. In 1907 Thévenot and Gabourd brought the subject up to date. In 1910 Steimker, and in 1911 Baudoin produced excellent articles. Among many other writers who have studied the subject may be mentioned Gosselin, Belfinger, Graser and Duplay. The latest contribution, in which a most excellent review of the subject by Augé and Simon is achieved, appears in a recent issue of *Revue de Chirurgie* (1921, lix, 297). It is rather striking that apparently little consideration has been devoted to this particular type of hernia by American writers. Perhaps the excellent work by French, German and English writers has made it unnecessary.

Etiology.—Berger states that from a standpoint of production two sorts exist:

1. Under a cicatrix or a complete or incomplete rupture of the abdominal muscles. 2. Spontaneous.

The cicatricial type is that type which follows trauma to the abdominal wall which may or may not have broken the skin. This type being self-evident need not be further discussed here except to mention that in certain cases in which ventral hernia may follow trauma after several years have lapsed, the trauma may have been entirely secondary and incidental to the production of the hernia. Belfinger states that traumatic hernia must be completely developed immediately or within a few days after receipt of the injury and that there must have been no predisposition to hernia, no matter of what nature, thus no latent hernia, no empty hernial sac.

These herniæ are most frequently seen in women. Of twenty-nine cases of ventral hernia reviewed by Berger at the Central Bureau (France) there were twenty-three in women; twenty of these were spontaneous. Berger believes them most common in fat women about thirty years of age. Augé and Simon list twenty-seven women in a report of forty-seven cases, the youngest being twenty-five and the oldest seventy-two. The youngest male reported was one-half year, the oldest forty. These ages are apparently unimportant, however, for they relate only the age of the patient when seen by the surgeon. The date of origin would be more valuable. Unfortunately this is in most cases uncertain. Many of the patients, however, evidently had their herniæ a number of years before presenting themselves. The longest duration we have ascertained is sixteen years. It is evident that the origin may precede the descent of contents into the sac by an indefinite time.

Pathological Anatomy.—The site of these herniæ depends primarily upon a solution of continuity of tissues in the abdominal wall, and they are usually limited by the fibrous contour. Peritoneum stretching over a point of weakness finds its way outward forming a sac. Intra-abdominal pressure may be a deciding factor. Rupture of the " posterior fibres and sheath " is essential, says Berger.

Cooper showed that spontaneous ventral hernia usually presents along the line of Spiegel, and particularly at the " junction of the aponeurosis of the transversalis and posterior fibres of the sheath of the muscle." He was the first to point out (1804) that " blood-vessel openings through the abdominal wall " were frequent sites of ventral hernia. Mackrocki, Regnier and Brennan have expressed belief that at this level numerous " hiatus vasculo-nerveux " (which give perforating " anterior and external " vascular branches and nerves to the abdominal wall) are causative factors.

Ferrand, basing his opinion upon two dissections, states that below the umbilicus there are diastases between the aponeurotic fibres of the transversalis due doubtless to the projections of branches of the deep epigastric arteries which wind between the thin transversalis fascia and the posterior layer of the aponeurosis of the internal oblique. Cooper pointed out also that next these vessels the muscle may be lacking, predisposing to hernia, which, however, may pierce the transversalis at one point and penetrate the overlying area at some distant point. Graser called ventral herniæ outside Spiegel's line " seitlichen Bauchbruch " and believed them due to muscle defects or acquired

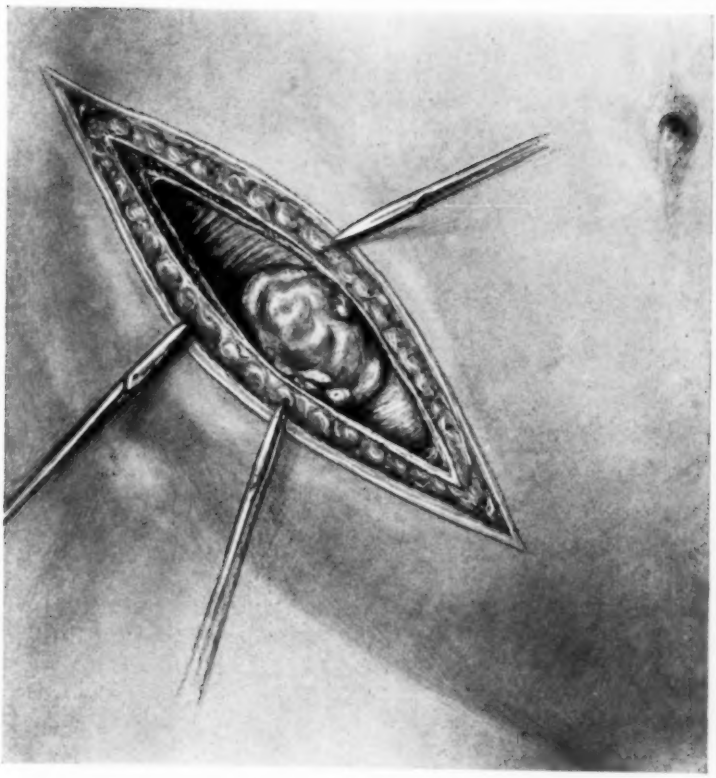

FIG. 1.—Lateral ventral hernia, presenting above and lateral to the internal inguinal ring. Sac exposed by an incision through the external oblique muscle and aponeurosis.

muscular paralysis. There may be arrest of muscular development. In such a case merely a fibrous membrane present in this portion of the abdominal wall. Phlegmon or abscess in the abdominal wall, as from the iliac crest, has been offered as a source of weakness. Platner held that hernia could pierce muscular parts by "separating muscular fibres," but Berger says it would be difficult to find an instance where a true spontaneous ventral hernia had a sac in which the neck was bounded by muscle tissue. B. Schmidt described a preformed peritoneal sac due to the drag of preperitoneal fat as a predisposing cause.

Le Dran pointed out repeated pregnancies as the most frequent cause. Augé and Simon have concluded that increased intra-abdominal pressure from any cause is primary and they quote Boyer (1822) as saying "of all causes most capable of pushing against the closed abdominal wall, the simultaneous contraction of the diaphragm and the abdominal muscles is most effectual." In vomiting, in labor, carrying burdens, expelling retained urine and accumulated fæces, we most commonly find such conditions. Crushes, blows and falls on the abdomen are evidently to be considered. In such cases the trauma sustained may obscure the spontaneous origin of a preëxisting hernia or a sac.

Spiegel line herniæ are usually single. They may be multiple. Berger states that in one patient he saw two on the right side and one on the left, not symmetrically placed.

Diagnosis.—Many opinions are expressed as to the ease or difficulty of diagnosis. Some cases present with the diagnosis outstanding. The patient may have known the presence of an inconstant tumor mass in his side. These cases usually should present no difficulty, especially if the patient is thin, but often the diagnosis is merely presumptive. If the hernia can be seen or felt there is no difficulty. The interstitial type presents more difficulties, and authorities claim that these may defy detection. In our case no amount of effort or manipulation could cause a hernial protrusion. No depression could be located. Others have found the same difficulty. In the case of a patient who presents himself offering a history of having repeatedly seen a reducible swelling in a particular area, painful, causing digestive upsets, perhaps also vomiting and constipation, the diagnosis of a hernia is simple. Many patients have been operated upon without having the hernia discovered at all. In a fat person the hernia may be unreduced but effectually hidden in subcutaneous fatty tissue. A. Mouchet and R. Gouverneur present their case as an illustration of diagnostic difficulty. A soldier twenty-four years of age had received a kick in the abdomen just above the groin seven years previously. Sometime later a tumor was noticed by him about the size of a small nut in the region of the injury. It was painless and little noticeable, never causing trouble. An army physician examining him failed to notice it at all. Later, following a fall in a trench the hernia became larger and painful. Operation showed the hernia coming through all three muscles above and to the outer side of the internal ring and containing omentum. These writers believe that

TABLE I.

	Size and Site	Ring	Contents	Strangulation Diagnosed	Possible Etiology	Remarks
No. 1. M, 24. Mouchet & Gouverneur, 1916	Pigeon egg para-inguinal in ext. obl. & transversalis	Buttonhole	Omentum	Subacute, before operation	Kick in groin from horse 7 yrs. previously	.....
No. 2. M, 20. Williamson, G. H. 1915	"Not large" above and to inner side int. ring	Tight fibrous band	Ten inches ileum	Subacute. Inguinal hernia	.....	Duration about 2 yrs.
No. 3. F, ( ). Jordan, F. 1883	Tender spot well outside ing. canal between umbil. and groin	.....	Flat sac with 8 inches bowel	48 hrs. before operation	.....	Previous health good. Diagnosed upon signs of obstruction. Gave signs of acute appendicitis and ureteral calculus. Recovered.
No. 4. M, 69. Teale, T. P. 1842	Left abd. wall between umbilicus and iliac spine	Tendinous on mesial side. Soft on lateral side.	Colon and adherent omentum	Before operation	.....	Died 12 hrs. after op. Colon intensely inflamed.
No. 5. F, 25. Gosselin, 1881	Thinned out space between umb. and ant. sup. spine	.....	.....	Several attacks of subacute. Before operation	Coughing	Noticed only few days.
No. 6. M, 63. Terrier, 1878	Left border rectus above int. ring. Sac would admit tip of finger	Annular tightly constricted	2-3 cm. gut	After operation		Six days of pain, occasional vomiting. No bowel movement, no flatus.
No. 7. M, 48. Robinson, B. 1914	Left side above ing. canal	Little finger	Knuckle small gut	Before operation	.....	Noticed 2 yrs. especially in winter when had bronchitis.
No. 8. M, 53. Coley, Wm. 1909	McBurney's point	7/8 inch diam., firm	Loop cæcum	Before operation	Horse fell on him 7 yrs. previously	Indefinite symptoms of pain in region of appendix shortly after accident, lasting about 4 years.

No. 9. F, 66. Baudoin, 1911	38 by 34 cm. in 3 pockets	Level of umbilicus in left lat. abdom. wall all tight	Colon, cæcum appendix. Small gut, omentum. Partly adherent	In parts. Upon sight	Lifting weights	Duration 6 years. Umb. orifice normal when examined. Recovered.
No. 10. F, 44. Moller, H. 1919	Internal to iliac spine 4 cm. diam. midway to rectus border	.....	Adherent omentum	.....	.....	Reducible tumor 15 yrs.
No. 11. M, 72. Moller, H. 1919	Sac 7.8 cm. long to mesial side muscle fibres of left int. obl. and transversalis	.....	Adherent omentum	Before operation	.....	Operated 1908 for double ing. hernia.
No. 12. F., 57. Macewen, John A. C. 1907	Sac 1⅗ in. long but very distensible midway vs. umb. and symph. in R. sem. line	Narrow	Empty when operated	.....	.....	Complained pain 2 yrs. prev. to op. complicated with small umbical hernia.
No. 13. F, 80. Robinson, H. B. 1907	Rt. iliac fossa, above ing. canal	.....	Adherent omentum	Signs of obstruction before operation	.....	Symptoms 4 days. Found external to deep epigastric artery.
No. 14. M, 25. Barthélemy, 1919	In rt. iliac region just above Douglas' fold	.....	.....	Before operation	Appeared suddenly while lifting heavy joist	Existed 2-3 mos. before op. Easily reducible.
No. 15. F, 47. Watson, 1919	Between gall-bladder and appendix	.....	Adherent omentum	Repeated attacks, subacute	.....	Duration about 5 years.
No. 16. M, 35. Brennan, 1899	Rt. semilunar line	.....	Intestine and omentum	.....	Appeared suddenly while at work	.....
No. 17. F, 34. Holloway, 1921	8 cm. above and to outer side rt. ing. ring	.....	Empty	No. At operation	Noticed first while lifting moderate weight	Duration about 2 years.

the hernia was not due to the kick but that it preëxisted as a congenital diverticulum of peritoneum; that the kick and fall merely contributed to its enlargement and strangulation.

S. Steimker found in the cadaver of a fifty-year-old man, with bilateral inguinal hernia and a supravesical hernia, also a defect in the abdominal wall six cm. horizontally and medially from the left anterior superior spine of the ilium; this was a round three cm. wide opening with a seven cm. deep sac protruding. This sac was embedded in the muscles of the abdominal wall. The medial boundary of the sac was the lateral margin of the left rectus. The lateral boundary was not clearly visible or palpable.

Steimker relates that in an unreported case of Braun in a male thirty-eight years of age, with symptoms of intestinal obstruction, coming to operation, a mass was discovered in the left lower quadrant of the abdominal wall. There was found a strangulated hernia in a sac of peritoneum with an opening the size of a mark piece (German coin) resembling the inguinal ring. (*Beit. z. klin. Chir.*, 1912, lxxxii, 633).

It is apparent then that these herniæ may exist for an indefinite time unobserved and absolutely without symptoms. The patient may recognize a disappearing painful tumor, but he usually does not understand its significance. He comes to the surgeon because he associates the tumor with a certain amount of pain, burning or tearing in his abdomen which hinders his work. Usually the tumor will disappear upon lying down.

Palpation may reveal merely a painful spot. Sometimes a tumor mass may be felt which upon pressure reduces with an audible gurgle; or the finger may locate an orifice.

If the patient leans forward the tumor may appear. Anything to increase intra-abdominal pressure may cause the hernia to protrude. Often, however, all efforts fail and a presumptive diagnosis is made only upon subjective symptoms.

These herniæ are especially liable to incarceration or strangulation. The extremely distensible sac with a very narrow neck and orifice favors such a result. Gangrene then supervenes rapidly. Most of the cases reported have been found to have been completely or partially strangulated at one time or other, sometimes several times. But even as such, they are sometimes not clearly defined. Cases are reported where acute appendicitis, pyelitis, and cholecystitis have been confusedly diagnosed. Inguinal hernia may be the preoperative diagnosis. No diagnosis at all has preceded some operations where the symptoms of obstruction have led the surgeon to believe that exploratory laparotomy was necessary and justifiably so.

Treatment.—Operation offers the only hope of permanent cure. It is to be substituted by conservative treatment only in cases in which any operative procedure is contra-indicated. Operation consists in freely exposing the sac by incision, complete excision of the sac and obliteration of the orifice. The overlying structures are then to be closed in layers without necessarily overlapping the fascial or muscle plates. Symptomatic relief may be secured by

wearing a tight abdominal belt. In children with diastasis of the recti adhesive straps may be effectual as in umbilical hernia. Usually such treatment is merely palliative.

In cases where the location of the hernia is indefinite we may accept the patient's idea of the location as a key to the situation and make our incision accordingly; though some operators prefer to make a median laparotomy incision and search out the hernia from within, especially when the hernia is concealed by a pendulous or obese abdomen, or thick muscle walls.

In the accompanying table are recorded seventeen cases of lateral ventral hernia (including that reported herewith), eleven of which are not included among those tabulated by Augé and Simon in their recent paper. (*N. B.*—Cases Nos. 1, 2, 7, 9, 10, 11, 12, 14, 15, 16, 17.)

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THE LOW TRANSVERSE INCISION IN OPERATIONS UPON THE THYROID GLAND*

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The failure of so many of the earlier lobectomies to cure a sufficiently large percentage of the toxic goitre cases led many years ago to the more complete removal of portions of both major lobes even to the extent of five-sixths or nine-tenths of the glandular tissue, as Porter states in 1916. More has been resected in these hyperplastic gland cases with excellent late result.

The liberal curved transverse incision enables us to expose the whole gland before commencing removal and to judge with considerable accuracy the amount of gland tissue to be left *and its character.* One still sees many lobectomies done for hyperthyroidism as well as for other conditions of the gland with the vertical straight, curved or angular incision and with the usual result of a more or less prominent and disfiguring cicatrix and considerable asymmetry of the neck. While most operators are agreed that Kocher's incision is the best for thyroidectomy, that is the curved transverse or collar incision across the neck over the most prominent part of the tumor mass, a fewer number are willing to concede that it is the best for nearly all operations upon the gland. It has its advocates for ligation of vessels alone. In conditions of hyperthyroidism this transverse incision with the ligation of enlarged subcutaneous and capsular veins of itself seems to have a greater therapeutic action than the smaller one-sided incision as Ochsner mentions in speaking of ligations and thyroidectomy. Its employment in highly toxic cases for simple ligation is scarcely advisable. It has been suggested that the beneficial action of simple ligation in this class of case is as much due to the interruption of the sympathetic nerve branches accompanying the large vessels as to the diminution of the blood supply. This is probably true.

Some years ago the observations of a somewhat prolonged stay at Kocher's clinic in Bern, impressed me very much with the advantages and possibilities of this wide cross incision. I would like to suggest a modification of this incision only to the extent that it be made even lower down, crossing the neck shortly above the sternal notch, and this for cosmetic reasons largely, although the practical absence of a lower flap allows better and shorter drainage and gives better access to the lower poles of the gland and to the retrosternal glandular tissue which is not an infrequent occurrence.

This incision for operations upon the gland begins at the external jugular vein upon one side and extends in a slightly downward curve across

* Read before the New York Surgical Society, March 8, 1922.

FIG. 1.—Adenoma of thyroid. Both lateral lobes affected. Four years and eight months after operation. Cicatrix just seen.

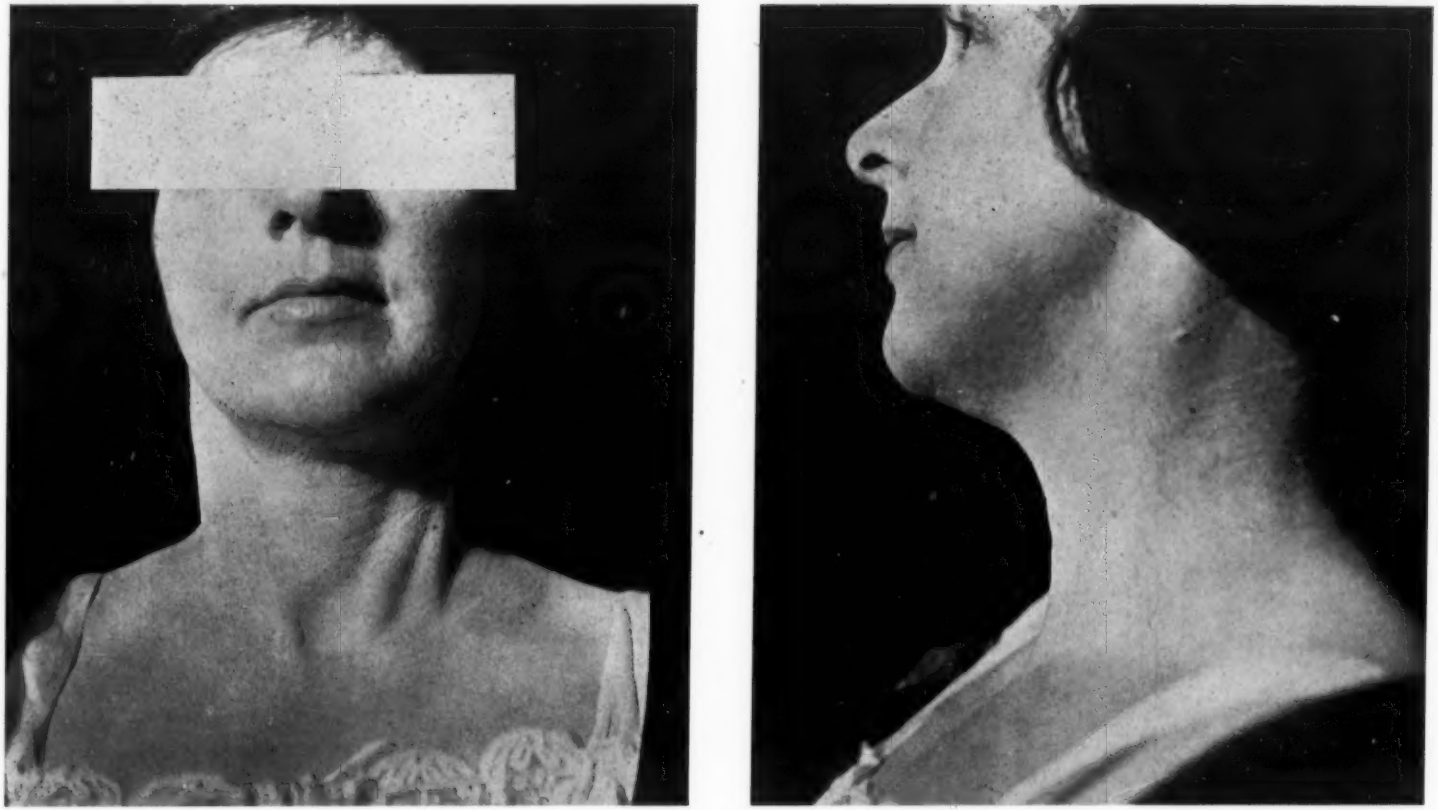

FIG. 2.—Adenomatoid hyperplasia, affecting scattered areas both lobes. Cicatrix barely appreciable. Two years and seven months.

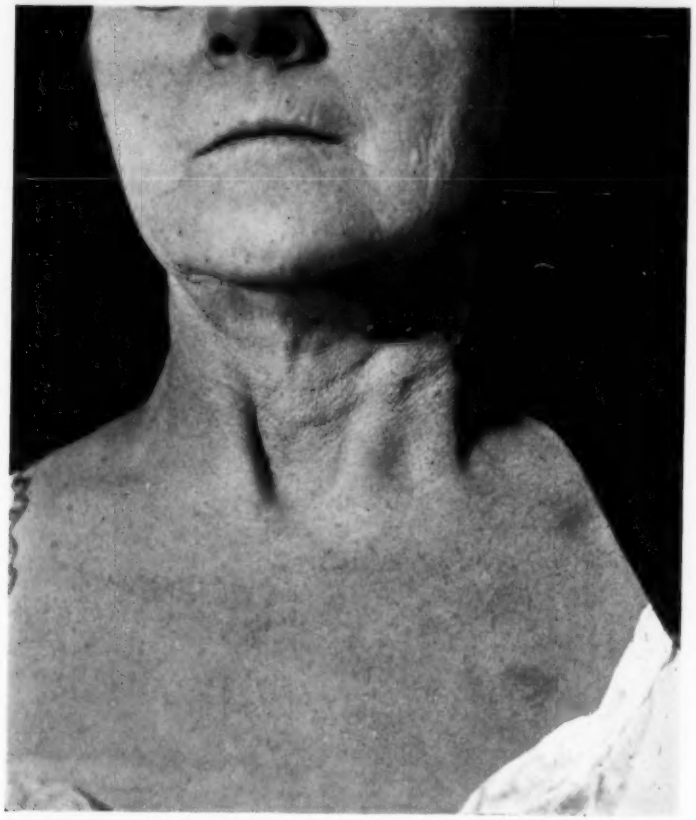

FIG. 3.—Large thyroid cyst with interstitial thyroiditis. Three years and eight months after operation.

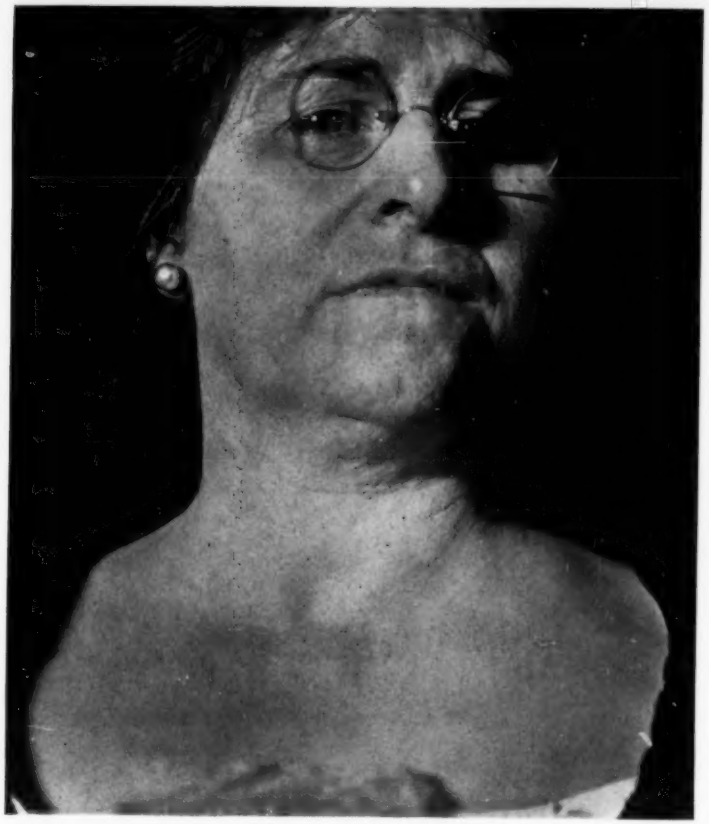

FIG. 4.—Colloid goiter. Enlargement first noticed twenty years before operation. Four years and five months after removal.

FIG. 5.—Goiter chiefly colloid with adenomatous hyperplasia. Toxic symptoms with elevation of metabolism rate. One year after removal.

FIG. 6.—Cyst of thyroid isthmus. Line of incision just above sternal notch. Four years and five months after removal.

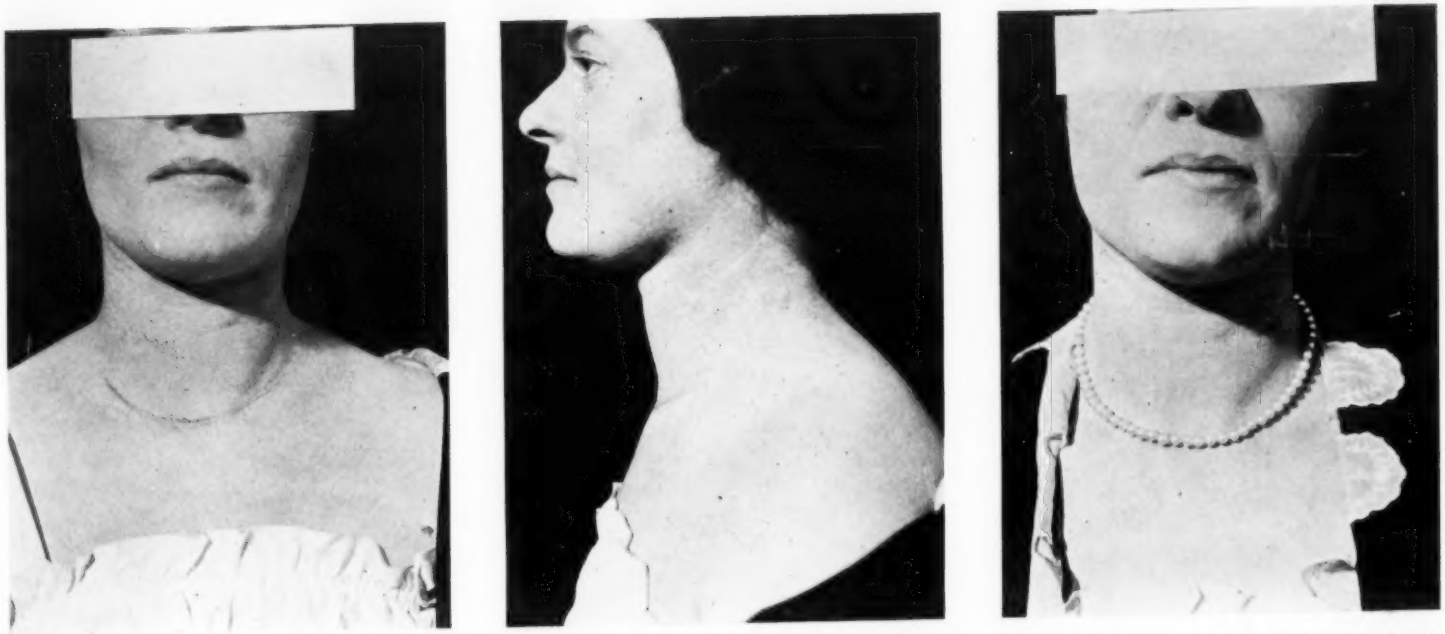

FIG. 7.—Adenoma of thyroid. Moderate toxic symptoms. Symmetrical enlargement of gland beginning four years before admission. Ligation of arteries four months before thyroidectomy. Eight months after operation showing recent cicatrix.

the neck following as accurately as possible the lines of the neck and ends at the external jugular vein upon the other side. It has very rarely been necessary to prolong the line beyond these limits. The flap is reflected upward and the muscles retracted without cutting. The gland capsule and gland are well exposed. It has rarely been necessary with this exposure to cut the muscles. If we are dealing with an adenoma or cyst of one lateral lobe the incision need not be carried so far upon the other side. But it should always be sufficient to secure good inspection and ease of access. The length of the incision matters but little in the after-appearance and means much in the time saved at operation.

Such an exposure enables the operator to inspect the gland fully, remove tumors and gland tissue or the larger part of both lobes with the isthmus in hyperthyroidism with comparative ease. The elevation of the gland always leaving the posterior capsule intact and untouched, thus obviating danger to the recurrent nerves and the parathyroid tissue. It enables the operator to secure large vessels and main tributaries before beginning the removal and clamp every bit of tissue before its excision. This is a great advantage in the very vascular hyperplasias.

The rapidity with which such a flap can be raised and exposure secured has much to recommend it. There is but one precaution I would mention and that from a cosmetic standpoint. Where the skin of the neck and upper chest is quite mobile and the breasts rather heavy, the incision should cross a little higher or the final cicatrix may be drawn below the top of the sternum. There is often slight temporary œdema of the flap where good-sized veins are ligated, but this clears up rapidly.

This incision offers, therefore, a (1) more rapid and greater accessibility to the gland, (2) better inspection, (3) a safer and easier technic, and (4) the best cosmetic result.

Eighty-eight (88) per cent. of the cases have been seen following operation at periods varying from one to eight years after. The results have been so universally good that it has seemed worth recording this modification of an old incision. The photographs show average cases and are of patients accessible within the last month.

EXTRACRANIAL ANEURISM OF THE INTERNAL CAROTID*

REPORT OF A CASE

By Nathan Winslow, M.D.

of Baltimore, Maryland

FROM THE SURGICAL CLINIC OF THE UNIVERSITY HOSPITAL OF THE UNIVERSITY OF MARYLAND

Aneurism of the cervical portion of the internal carotid artery is uncommon. Crisp,[1] in 551 aneurisms, found twenty-five of the carotids, and of these only three were of the internal. Wyeth,[2] in 789 ligations of the common carotid, mentions but four for aneurism of the internal carotid in its extracranial portion. Monod and Vanverts,[3] in a collection beginning with 1895, tabulate eight cases. Bobbio,[4] in 1906, cites eighteen. Many of the standard authors have never had a case under their personal supervision. Von Bergmann[5] states there are but few observations reported on extracranial aneurism of the internal carotid and mentions only one instance that of Wyeth. In speaking of arterio-venous aneurism in the same locality, the above-mentioned author says, it is also a rare lesion and he incorporates in the text but two illustrative cases, one by Giraldès,[6] the other by Joret.[7] Callander,[8] in a recent contribution, adds ten additional examples. Two of these (Chartier[9] and Quenu's[10] cases) are fistulas between the common carotid and the internal jugular vein. Of the carotids the common is most frequently the seat of aneurism. According to Barwell,[11] eighty-seven and twenty-five hundredths per cent. affect the common; seven per cent. the external and five and seventy-five hundredths per cent. the internal carotid. The sole interest in this affection does not reside in its rarity, of equal concern is the liability of its being mistaken for tonsillar abscess, from its proclivity when it does occur, of appearing in the neighborhood of the tonsil. As a consequence of this peculiarity it has been lanced in the belief of its being a collection of pus. Lee[12] made this mistake, the patient bleeding to death in a few minutes.

Duke (*Dublin Med. Press*, 1848, vol. xix, p. 65) cites a similar accident. He was about to evacuate a supposed abscess in a patient of his when a finger fortunately introduced into the mouth detected aneurismal pulsation. A consultant did not consider the condition so serious and lanced the swelling. There was a gush of blood, the arrest of which necessitated ligation of the common carotid artery. The bleeding was controlled but the patient eventually died of secondary hemorrhage. Gross[13] endeavors to drive this lesson home by graphically relating a case recorded by Syme.[14] A woman had a tumor for about five months in the throat in the usual situation of abscess of the tonsil. It exhibited a diffuse appearance when viewed through the mouth and pulsated in a strong and characteristic manner throughout. Ligation of the common carotid diminished but did not entirely arrest the throbbing. The patient died thirty hours after the operation, without an assigned cause. Gross naively adds, had a less careful surgeon had the management of this case, he might probably have punctured the tumor under the

* Read before the Southern Surgical Association, December 13, 1921.

supposition of its being an abscess, and thus hurled the patient out of existence. Agnew[16] bases his opinion about making a diagnosis on the ability of the physician to both see and feel pulsation. Johnson[16] and Booth[17] have both reported cases in which they were unable to detect any pulsation or to hear a bruit. Agnew fails to take into consideration the possibility of the patient being unable to open the mouth sufficiently wide to permit the passage of a finger. Yet instances of this character have been recorded. The cases of Perier,[18] Pircher[19] and Neuffer,[20] quoted by Prewitt,[21] serve to illustrate this point well.

Pircher (*Wien. med. Wochschr.*, 1862, p. 553) relates the history of a case in which the symptoms were so obscure and misleading that he completley failed to realize the true nature of the condition, believing until the death of the patient he was confronted with an acute abscess. The patient, a girl, aged eight years, was seized suddenly, January 12, 1862, with a severe pain and swelling in the upper part of the left side of the neck. The inflammatory process rendered opening of the mouth insufficient for the insertion of a finger. He was so convinced he was dealing with a deep-seated abscess that he lanced the neck, but not finding pus, as he thought at a sufficient depth, he desisted in the belief the abscess would work its way to the surface. About the eighth day there was a hemorrhage from the throat, after which the patient became more comfortable and could open the mouth. Pircher now inserted a finger, but could detect no pulsation, only a soft, fluctuating tumor occupying the left tonsillar region. He then called in two consultants who confirmed his opinion of abscess. Pircher, therefore, made a stab externally with a trocar, thus hoping to reach the abscess cavity, again without success. The child, however, continued to improve and was apparently on the road to recovery when early in the morning of February 7, 1862, after a restful night, she had a copious hemorrhage into the throat and expired in a short time. The author at no time seemed to sense the trouble and was unable to account for the origin of the bleeding. It was only at autopsy he became aware of the nature of the lesion.

In Perier's[18] case there was rapid swelling in the throat, great pain, high fever, inability to open the mouth and altogether a condition so perplexing that Perier was unable to decide the true character of the disease. It was treated by rapid venesection and hot fomentations. At the end of nine days hemorrhage from the throat occurred and at intervals was repeated. On the fourteenth day M. Récamier was called in, and while attempting to introduce a finger into the mouth, which was done with great difficulty, a profuse hemorrhage occurred and the patient soon succumbed.

Neuffer's[20] case was that of a boy, thirteen years of age, who was taken with symptoms of inflammation of the throat and a diagnosis of angina tonsillaris was made, and the case treated as such. There were present fever, pain, swelling in the throat, noise and throbbing in the head and inability to open the mouth beyond three or four lines. On the twelfth day a profuse hemorrhage occurred. It was repeated on the next day and the patient soon expired. The autopsy showed an aneurismal dilatation of the internal carotid artery as large as a walnut with an opening leading into the pharynx.

The diagnosis of lesions in this region is mainly between aneurism of the extracranial portion of the internal carotid artery and abscess, rarely malignancy, and is to be determined upon the same general principles that apply elsewhere in differentiating these affections. The danger of falling into error in considering deep-seated tumors in the neck should ever be borne in mind. The history is of inestimable value in avoiding pitfalls. Mudd, in

Hulbert's [22] case, obtained a history of a lump antedating a scarlatinal sore throat and was thus led to a correct conclusion. Failure to resort to digital examination when possible is inexcusable. Rely upon touch as your sheet-anchor and mistakes will be reduced to a minimum. The examples, above mentioned, should serve to illustrate the importance of making a careful examination in every instance of a smooth tumor lying behind the pharynx, or in which the tonsil is lifted out of its bed. The symptoms of aneurism of the internal carotid in this locality are, in the main, most characteristic and not as some observers would lead us to believe obscure. There will be a tumor pushing the tonsil inwards toward the midline or even across the middle of the pharyngeal cavity. With but rare exception, as hereinbefore noted, the lump is both accessible to sight and touch. It presents as either a circumscribed or somewhat diffuse, rounded, pulsatile swelling crowding into the fauces. To digital examination it is soft, elastic, and pulsates throughout its entire extent. Externally there may be no evidence of the disease, or there may be a fullness or a distinct tumor behind the angle of the jaw and in front of and below the ear. In the latter event pulsation is felt and a souffle is heard by auscultation over this area. With a finger inside the mouth and another on the neck, the mass is felt to be expansile. Both murmur and pulsation disappear when the common carotid artery is compressed against the vertebral column, to reappear immediately on release of the pressure. Arrest of the circulation causes a diminution in the size of the growth. Those afflicted with this affection often complain of an annoying roaring and buzzing in the ear, persistent, severe and unbearable hemicrania, vertigo, weakness and other symptoms due to cerebral circulatory disturbance. Swallowing of solids is sometimes impossible, and is usually accomplished with difficulty. Liquid food is frequently regurgitated. Dyspnœa is a common complaint. If the hypoglossal, glossopharyngeal or vagus nerve is involved, the organ which it serves is paralyzed, as indicated by deviation of the tongue on protrusion, interference with swallowing or hoarseness. As uncommon as is the disease, it occurs sufficiently often to call for a careful examination in every instance of unilateral pharyngeal tumefaction. When in doubt, the diagnosis may be made with the aspirating needle. A dry tap does not eliminate aneurism, as the point of the needle may be entangled in or its bore may be plugged with clot, but the withdrawal of pure blood is positive proof of its presence. As diagnostic puncture leaves the sac wall weakened, it should not be practised unless the patient is so situated that a prompt operation can be done in the event of a rupture through the path of the needle. It is true, aneurism of the internal carotid rarely points in the neck, but Prewitt,[23] Agnew,[24] and Pircher [25] are among those who have recorded observations of this sort. The absence of cervical swelling is explained by the dense cervical fascia in front and the cervical vertebræ behind crowding the gradually dilating sac inwards toward the tonsillar fossa where the comparatively weak superior constrictor muscle and the pharyngeal fascia interpose but slight resistance to its progress. Equally as fallacious is the contention of those who assert,

aneurism of the internal carotid always presents in the throat, as thoroughly reliable operative and necropsy proofs have been adduced to the contrary. Porter (*Dublin Hospital Reports,* 1830, v, 208, and later *Dublin Jl. Med. Sc.,* 1840, xvii, 83) reports a case of aneurism of the internal carotid without signs of tumor in the pharynx. The patient, a woman, came to autopsy seven years after the common carotid artery had been ligated for an aneurismal tumor in the upper part of the neck. The necropsy revealed the remnant of an aneurismal sac of the internal carotid artery. Moser (*Inaugural-Dissertation,* Strasburg, 1911, p. 7) tells of a woman who sought relief for a tumor in the right side of the neck which pulsated synchronously with the heart. Though nothing abnormal was found in the throat, at operation an aneurism was found springing from the internal carotid. In isolated instances pulsation may be absent or so weak as to escape detection. Under such circumstances the aspirating syringe has given the clew to the true nature of the lesion. In a chronic unilateral swelling with bizarre signs, unusual care needs be exercised to avoid a mistake in diagnosis. Dubrueil (*Gaz. méd. de Par.,* 1883, liv, 6.s., pp. 373 and 398) interpreted a case of this sort as an adenoma or sarcoma and attempted extirpation. During the process of enucleation he tore the sac wall and caused such a hemorrhage that a prompt ligation of the common carotid was necessary for its control. Several hours later the same day, he made a second ligation of the primitive carotid and at the same time tied the external and internal carotids and superior thyroid arteries for a repetition of the bleeding. Unfortunately the patient died on the fourteenth day of hæmiplegia. At autopsy an aneurism of the internal carotid was revealed as the source of the swelling. Helferich (*Deutsch. Ztshft. f. Chir.,* 1902, lxvii, 592) made the same mistake, but saved his patient by operation.

The surgical treatment of aneurism of this vessel in its extracranial course has necessitated attack at one time or another upon all of the carotids, therefore a brief consideration of the development of carotid surgery is not amiss. Hebenstreit [26] and Fleming,[27] in 1803, ligated the common carotid artery successfully for hemorrhage. In 1805 Sir Astley Cooper [28] ligated the common carotid for aneurism, the patient succumbing on the twentieth day. He repeated the operation in 1808, the aneurism was cured and the patient recovered. Since these ligations the common trunk has been tied times innumerable by many operators, for lesions of itself and branches. Syme [29] occluded it in 1842 for extracranial aneurism of the internal carotid artery. Gurdon Buck,[30] in 1848, tied the internal carotid for a wound. He had previously ligated the common trunk without success. W. T. Briggs,[31] of Nashville, Tenn., in 1871, for traumatic aneurism of the internal carotid, ligated the internal branch above and below the sac successfully. Bushe,[32] in 1827, ligated the external carotid for hemorrhage and Richard,[33] of Paris, in 1855 for aneurism. It remained, however, for John A. Wyeth [34] to place the surgery of the carotids upon a rational basis. In 1878 this surgeon attacked the prevailing practise of ligating the common carotid for lesions of

its branches. As a result of his investigations covering the reports of 789 ligations of the primitive carotid, eighteen of the internal and ninety-one of the external, he severely condemned the practice of tying the common for lesions of the external or its branches when a ligature can be applied between the diseased area and the bifurcation of the common carotid. He gave as his reason for this conclusion a death rate of four and one-half per cent. in ligation of the external against forty-one per cent. in the common. In lesions of the cervical portion of the internal carotid, aneurism excepted, he urged ligation of this vessel above and below the seat of trouble, because of the possibility of a recurrent flow through the circle of Willis with bleeding to death if the cardiac side alone is ligatured. In aneurism of the extracranial portion of the internal carotid artery the operation of choice is deligation of this vessel between the sac and common trunk, this despite the possibility of seepage from the circle of Willis, as the current in this event is too sluggish to cause trouble. Should this be infeasible, the common and external carotids should be tied, together with all branches of the external on the cardiac side of the ligature. If the common carotid alone be tied, there remains an open channel between the terminal branches through the segment of the primitive above its point of ligation by means of which the circulatory flow might be reëstablished and the object of the operation compromised. According to Bobbio [35] the common carotid has been ligated eleven times in eighteen cases of aneurism in the cervical portion of the internal carotid, with six recoveries. In relapsing aneurisms, which return despite ligation of the internal carotid, Matas [36] suggests extirpation, or preferably, obliterative endo-aneurismorrhaphy, provided it is possible to secure the upper as well as the lower pole of the sac for hæmostatic purposes.

From the inception of carotid surgery until the present time, the possible occurrence of cerebral disturbances has invested a simple technical procedure with a gravity associated with but few operations. To avoid the evil results of disturbed cerebral circulation Halsted advises temporary occlusion of the common carotid under local anæsthesia before attempting obliteration of the diseased artery. Usually a defective circulation is indicated by the prompt appearance of dangerous symptoms. If untoward manifestations do develop the constricting band should be promptly removed. Although this precaution was not observed in my case, neither at the time of ligation nor subsequently, did any harmful symptoms arise? Perhaps the lack of development of baneful symptoms in ligation for aneurism is due to an already partially established collateral circulation. However, despite my experience competent operators are agreed ligation, either of the common or internal carotid, is not an operation to be undertaken lightly, because in a certain percentage of cases hæmiplegia follows the ligation and in many of these cases this complication is fatal. The paralysis is due to a thrombosis starting from the point of ligation and extending to the cerebral arteries. Johnson [37] says it occurs in fifteen per cent. of the cases. According to DaCosta [38] in from twenty to twenty-five per cent. of cases after ligature

of the common carotid artery there is cerebral softening or some other intracranial mischief. Crile[39] states of the cases developing cerebral trouble, one-half die. The direct operative mortality according to Crile is only three per cent. Horsley[40] states the danger of ligation of the common carotid increases enormously after forty years of age and is due to the diminished blood supply to the brain. In the young with elastic arteries, ligation of the internal or common carotid is comparatively free from danger. In the opinion of this surgeon cerebral symptoms vary from giddiness to complete hæmiplegia. As a security against undesirable symptoms, Jordan,[41] of Heidelberg, recommends a procedure which proved itself of value in animal experiments as well as in an operation for carcinoma of the neck, *viz.*, previous loose constriction of the carotid for forty-eight hours. By carefully constricting the carotid by means of a small flat piece of tape or catgut until the peripheral pulse just ceases, there is no injury to the intima and no clot formation. If the ligature be removed after two days, the peripheral pulse reappears and soon attains its normal strength. Preliminary ligation should be done under local anæsthesia so as to obtain prompt information of the cerebral effects. If disturbances occur after the constriction, the ligature is immediately removed from the artery through the wound, which has been left open, and the circulation restored to normal. By gradually increasing the constriction of the ligature one can under certain circumstances cause the development of a collateral circulation which may at first have been insufficient. This is also the teaching of Halsted and is based on the toleration of the carotid for temporary occlusion. Crile has demonstrated the common carotid may be clamped for forty-eight hours without permanently damaging the artery or causing thrombosis. Halsted employs the aluminum band for this purpose. It must not be forgotten that cerebral symptoms and death may occur one or two weeks after ligation. Matas[36] says in the light of this important suggestion the entire surgical treatment of the carotid must be revised. In the future no one will be justified in planning a deliberate operation for the cure of aneurism in this perilous locality without first testing the efficiency of the collateral circulation.

Aneurism in this situation is either true or false. The true are those in which either one or all of the tunics enter into the composition of the sac; the false are those in which the sac wall is formed by adventitious tissues. According to their causation, they may be classified as (1) spontaneous, (2) erosive, (3) traumatic. The spontaneous are those without apparent cause, hence the synonyms idiopathic, arterio-sclerotic, endogenous. The erosive are formed in abscess cavities by the absorption of the arterial walls by pathogenic microörganisms or their products, especially the pyogenic, hence exogenous, false. The traumatic are those due to contusions, bullet and stab wounds, etc. These may involve the artery alone or the artery and its accompanying vein. Recently much confusion has crept into the nomenclature by the misapplication of the term aneurism to recent collections of extravasated blood which pulsate. Such cases have been omitted from this

article, as these pulsating hæmatomata have no well-defined wall of fibrous tissue lined by endothelium. No matter what the type, they all give rise to practically the same symptoms and tend to present in the lateral wall of the pharynx.

The purpose of this paper is to insure a prompt recognition of this obscure lesion when it does occur, to assemble all facts pertinent thereto, to render in abstract, for the convenience of those interested in a further study of the condition, the cases reported in the literature and in particular to place on record a case that came under my care.

CASE.—J. T., a colored woman, married, aged forty-eight, cook, was admitted to the University Hospital, Baltimore, January 24, 1921, and discharged February 9, 1921, for a tumor in the throat, of nine months' duration. There was nothing in either her family or personal history which had any bearing on her condition. In April, 1920, she noticed a right-sided tonsillar swelling for which she called in a local physician, who, mistaking it for a tonsillar abscess, made a stab, evacuating only blood, no pus. Much to the woman's chagrin, instead of the lump decreasing in size, it gradually grew larger and finally so encroached on her fauces as to interfere with swallowing and to materially embarrass breathing. In addition there developed a most annoying roaring in her right ear, and with each cardiac impulse she felt as though her head would be jarred off her neck. She complained bitterly of a rhythmical thumping in the neck situated immediately behind the angle of the right jaw, persistent and intense headache and muffling of the speech. Upon viewing the throat through the mouth, a mass could be seen projecting inwards from the right pharyngeal wall and impinging on the uvula. The tumor was diffuse, smooth, elastic to touch and pulsated in its entire extent. It was located behind a rather small but otherwise normal tonsil. There was no discharge or ulceration. A puncture scar on the anterior pillar was plainly visible. Upon compression of the common carotid pulsation was promptly arrested to instantly return with the release of pressure. There was a puffiness behind the angle of the jaw, but no distinct tumor could be detected. With a stethoscope placed over this area a bruit was plainly heard. Combined intra- and extra-buccal pressure diminished the size of the swelling. With the above exception, examination of the body was non-productive. The blood-pressure was 130/80, the blood Wassermann negative, urine negative, the white cell count 11,400, polymorphonuclears fifty-nine per cent., small mononuclears thirty-one per cent., large mononuclears five per cent., large lymphocytes two per cent., eosinophiles two per cent., basophiles two per cent. The non-protein nitrogen, uric acid, creatinin, urea nitrogen and sugar content of the blood were all within normal range. X-ray examination of the cervical spine was negative. From the clinical findings a preoperative diagnosis of aneurism of the internal carotid artery in its cervical course was made. As the condition was urgent, operation was advised and accepted.

Operation: February 1, 1921; operator, Nathan Winslow, assistant, W. D. Owens; anæsthetist, C. R. Goldsborough. Under ether anæsthesia, the common carotid and its terminal branches were exposed and uncovered of their sheath from a little above to an inch below the bifurcation. Pinching the external carotid had no effect upon the pulsation of the tumor, but squeezing the common trunk arrested the throbbing instantly. A twisted-silk ligature was then applied to the external carotid close to its origin and another to the common carotid just below its division in order to cut off all possible channels to the internal carotid. With the tying of the ligatures all movement of the tumor ceased in-

stantly, never to reappear. The shutting off of the circulation had no effect on either pulse or respiration. The wound was closed without drainage. The patient was returned to bed in excellent condition. Convalescence was uneventful except for a transitory headache which disappeared in a few days. There was no rise in temperature worthy of note, no evidence of cerebral disturbance, no dizziness, no vertigo, no paralysis. Ten months have elapsed since the operation, the mass in the mouth has entirely disappeared, the roaring in her ear has ceased, there is no more jarring of her head, the hemicrania has stopped, no bruit is audible, no pulsation can be obtained. Though the trouble could have followed an erosion of the arterial wall by a deep-seated inflammatory process, there is not sufficient evidence to think the woman ever had a tonsillitis. An equally as plausible explanation is that the doctor nicked the vessel wall in doing puncture, but this does not explain away the preëxisting lump. From the one-sided origin of the trouble, my belief is that this aneurism occurred spontaneously, without appreciable cause, as witnessed by her previous excellent health. The negative Wassermann would seem to preclude lues.

Besides the nineteen cases cited in Tables I and II, I have found fifty-one cases recorded in the foreign literatures (see list appended). It is unlikely these represent all of the published cases. The list is as exhaustive, however, as a carful search of the literature would permit. In all but a few the original article was consulted, when this was inaccessible a reliable transcript was made use of. They number seventy. Of these thirty-six are spontaneous, ten erosive, thirteen traumatic and ten arterio-venous. In addition to these was one which cannot be classified. It was found by Arnould (*Bull. et mém. de la Soc. Anat. de Par.*, 1914, lxxxix, 168) in a subject in the dissecting room. Thirty-seven were males, thirty-one females, two not stated. In the spontaneous variety the females outnumbered the males by twenty-six to nine; in the remaining example of this type the sex was not given. Of the forty-eight instances in which cure was attempted by operation, thirty-two recovered, sixteen died. Of these, thirty were operated on since 1890, with twenty-four recoveries and six deaths; eighteen previous to 1890 with eight cures and ten fatalities. Twenty-one were not operated on. Of these, sixteen perished, one made a spontaneous cure (Lyot and Petit [42]), and four were in the same or worse condition when the report was made. The clinical course of the case found in the dissecting room was not known. Puncture was done for abscess five times. Of these cases one died immediately of uncontrollable hemorrhage, one three days later from a renewal of the bleeding. In the other three the common carotid was ligated immediately with the following result—one recovery and two deaths. Wagner [43] was spared this humiliation by failing to take along with him his instruments. Upon his return the next morning he was informed the patient had died during his absence of a hemorrhage into the mouth. The diagnosis was made five times by the aspiration of pure blood. In two instances the condition was taken for sarcoma and during attempt at extirpation the sac wall was torn. In both cases ligation of the main carotid and its internal branch arrested the hemorrhage,

one patient recovered but the other died, fourteen days afterwards, of hæmiplegia; two patients died on the operating table, one of asphyxia from rupture of the sac into the fauces and inhalation of the escaping blood, the other from the effects of chloroform. Treatment by compression was tried three times; twice it was supplanted by ligation, in the other case Vander Veer [44] thought he had made a cure, but about three months later the man suddenly fell dead. McMullen and Stanton [45] in their case attempted to make a cure by a restorative aneurismorrhaphy. The patient apparently convalesced nicely and had been discharged from the hospital, but a few days afterwards had to return for a hæmatoma beneath the scar. The wound was reopened and the source of the bleeding discovered to be from a rent in the wall of the vessel. Attempts to clamp the vessel failed on account of the friability of the tissues and the hemorrhage was only controlled with considerable difficulty by tamponing the wound. The patient had lost so much blood that she died three hours afterwards of collapse. LeFort,[46] in a case of arterio-venous aneurism, incised the vein, sutured the hole in the artery and capped the suture line with a section of the vein. Bruns,[47] Perthes,[48] Morestin [49] and Moser [50] practised extirpation of the sac. Agnew,[51] because of recurrence of pulsation in the sac, ligated the opposite carotid, but the patient died about a week later of secondary rupture of the sac into the mouth and sepsis. The common carotid was ligated alone twenty-two times with satisfactory results in thirteen instances. The internal carotid was ligated alone four times, with three recoveries and one death.

The ages were 8, 19, 19, 24, 23, 26, 28, 28, 30, 32, 35, 36, 38, 38, 40, 40, 41, 42, 44, 47, 48, 50, 58, 58, 60, 60, 63, 65, 74, 75, 76, 60, 60, 4, 6, 8, 9, 13, 18, 19, 20, 58, 60, 21, 22, 23, 25, 27, 28, 35, 48, 17, 20, 23, 25, 25, 28, 29, 32, 35, 37 years, respectively, a total of 61; the remaining nine are described as women twice, soldiers thrice, child once, men twice, dissecting room subject once. Those with the ages recorded were divided into decades as follows:

	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	Total
Spontaneous	1	2	5	6	7	3	6	3	33
Erosive	4	3	1	0	0	1	1	0	10
Traumatic	0	1	6	3	0	0	0	0	10
Arterio-venous	0	0	6	1	1	0	0	0	8
Total	5	6	18	10	8	4	7	3	61

Of the twenty-eight representatives of the erosive, traumatic and arterio-venous groups, twenty-one occurred before thirty years of age, whilst in the spontaneous series, twenty-five were first noticed after the third decade. The youngest patient was four years of age, the eldest seventy-six. Of the five between four and ten years of age, one recovered after ligation of the common carotid (Wulff, *Muench. med. Wochshft.*, 1900, p. 687), one died under anæsthetic (Hirsch, *Monatshft. f. Ohrenhlkh.*, Berlin and Wien, 1914, xlviii,

780), one died of secondary hemorrhage from the sac into the mouth after ligation of the common carotid (Liston, *Lancet,* London, 1842, i, 864) and two died without operation. Five out of the six patients between ten and twenty died, two without operation, one of rupture of the sac into the mouth during an attempt to ligate the internal carotid, and two of sepsis after ligation of the common carotid; the one to recover is reported to have made a spontaneous cure. Of the three patients in their seventies, one died after ligation of the common carotid of cerebral complications, one died without operation and one was in the same condition when discharged. Of those in their sixties, five recovered after operation, one died of hemorrhage secondary to aneurismorrhaphy and one after ligation of the common carotid with no assignable cause. These figures would seem to indicate that those below twenty and above seventy withstand this condition poorly. Of the thirty-six spontaneous, twenty-four were operated on, with fifteen recoveries and nine deaths; of the twelve unoperated, nine died and three were in the same condition or worse; of the ten erosive, seven were operated on with three recoveries and four deaths, three were unoperated, with two deaths and one recovery; of the thirteen traumatic, six recovered after operation, four succumbed, three were not operated on, all died; of the ten arterio-venous, eight were operated on, all recovered; two not, both died. Six of the sixteen operative deaths were attributed to cerebral complications, or thirty-seven per cent. Therefore in this series twelve and five-tenths per cent. of the patients operated upon died of cerebral disturbances. Seven of the operative deaths were attributed to secondary hemorrhage, two to sepsis and one to no assignable cause.

Though strictly speaking, not entirely confined to the internal carotid, a case of aneurism involving all three carotids reported by Walsham (*Proc. Roy. Med. and Surg. Trans., Lond.,* 1899, lxxxii, 223) merits notice here. The patient was a man, forty-nine years old, with the complaint of a swelling in the right side of the neck of six years' duration. The growth was the size of a cricket ball, globular, hard, and extended from the jaw almost to the clavicle. It did not pulsate and was not diagnosed until operation. It was suspected as a malignant tumor. A trocar was inserted but failed to evacuate blood. There was no bulging in the throat, no dyspnœa, no dysphagia. The operation done in 1895 consisted of ligation of the common carotid, external and internal carotids and extirpation of the sac. The patient was cured. Prosser (*Br. Med. Jl.,* 1897, i, 530) and Langenbuch (*Reunion libre des chir. de Berl.,* Séance du 14 Dec., 1891, in *Mecredi méd.,* 1892, III, No. 2, 21) report cases which have been cited as aneurism of the internal carotid artery. Owing to the indefiniteness of the reports, I have not included them in my collection. The following cases have been excluded because of insufficient evidence being adduced by the authors to substantiate their claims: Ludwig Meyer (*Archiv f. Psychiatrie,* Berl., 1875, vi, 84), in an article entitled "Ueber aneurysmatische Veraenderungen der Carotis interna Geisteskranker," includes what he considers eight examples of aneurism of the extracranial portion of the internal carotid artery. All of the observations were made at autopsy upon mentally deranged patients. From the solitary illustration featuring the article and the subject matter of the text, I am not inclined to admit them as aneurisms. The condition rather appears to have been a slight thickening of the arterial wall

at its point of origin. C. E. Benjamins (*Archiv f. Ohrenheilkunde*, 1908, lxxvi, 240) reports a case of aneurism of the right internal carotid with fatal bleeding from the right external auditory meatus from necrosis of the floor of the canal following the insufflation of arsenic powder by a medicine man for the cure of a discharge. The patient, a woman, fell into Benjamins' hands shortly thereafter, but died. Autopsy developed an aneurism of the internal carotid but I could not determine whether it was in the extracranial portion of the internal carotid or in the bony canal, so have not included it in the tabulation. Certainly there were no pharyngeal symptoms. At the time of the hemorrhage Benjamins believed the source to be an erosion of the internal jugular vein because pressure upon the common carotid artery did not control the bleeding. Frisch (*Berl. klin. Wochenshft.*, 1916, liii, 99) presented before the Royal Society of Physicians of Vienna, at the December 10, 1915, meeting, a patient with what he believed an aneurism of the internal carotid located at the base of the skull. The trouble originated from a gunshot wound. The presence of such signs as hoarseness, atrophy of the sterno-cleido-mastoid muscle and the half of the tongue corresponding to the affected side, and the development of a contracted pupil and ptosis on the side of the injury indicated damage to the vagus, spinal-accessory, hypoglossal and cervical sympathetic nerves. Behind the angle of the jaw was a pulsating tumor. Calcium lactate taken internally and pressure to the mass caused the pulsation to become less pronounced. Shaefer (*Allgemeine Zeitsft. f. Psychiat. u. Pyschisch-Gerichtliche Medic.*, 1887, xxxiv, 438), in an article, "Ueber die aneurysmatische Erweiterung der Carotis interna an ihren Ursprung," describes the same condition as aneurism as Meyer. To my mind the cases reported by Shaefer are not true aneurism. Ehrmann, of Mulhouse (*Bull. et mém. de la Soc. de Chir. de Par.*, 1878, n.s., iv, 664), reports the following very suggestive case: The patient, a male, aged twenty-two, laborer, of healthy appearance and good habits, entered the hospital April 28, 1875, in the service of Doctor Battenburg for an angina tonsillaire of but a few days' duration, which had localized on the right side. He complained of pain in the submaxillary region, dysphagia and fever. May 1st, toward 6 A.M., the abscess opened spontaneously into the throat, at the same time a stream of red blood flooded the mouth. When the sister on service reached the patient the hemorrhage had ceased. At 9.30 A.M. a new hemorrhage as sudden as the first, but less abundant, occurred. Inspection of the throat, which was accomplished with difficulty owing to the locking of the jaws, revealed redness, œdema and tumefaction of the velum and a distinct impulse was transmitted to a palpating finger. Scarcely a half hour later there was a repetition of the bleeding but on a grander scale. The patient was now in a state of syncope, quite exsanguinated, pulse thready and extremities cold. Delay was no longer permissible, so Ehrmann, with the assistance of Battenburg, made a ligation of the common carotid artery. On account of the size of the swelling the vessel had to be ligated below the omohyoid muscle. The post-operative course was favorable. There was no further bleeding, but by the end of the first week there was a tolerably severe febrile reaction with a persistence of the submaxillary puffiness. Finally there was a discharge into the mouth of a fetid pus. At no time were there any cerebral or nervous disturbances. In the beginning there was some aphonia, which, however, completely disappeared in three or four days. The patient was discharged cured, June 18, 1875. Ehrmann considered this a case of erosion of the internal carotid artery. A number of similar cases are recorded in the literature, notably by H. Fischer (*Arch. f. klin. Chir.*, 1899, lviii, 435), Pepper (*Br. Med. Jl.*, 1872, xi, 510), Hynes (*Lancet*, 1870, xxiv, 9), Fraser (*Br. Med. Jl.*, 1872, xi, 25), and Lovegrove (*Lancet*, 1870, xxi, 5).

CONCLUSIONS

1. Aneurism of the cervical portion of the internal carotid artery is not as infrequent as supposed.

2. Before incising a unilateral lump in the neighborhood of the tonsil, especially if of long standing, look, feel, listen.

3. Spontaneous cure may occur, but the usual termination in untreated cases is death from rupture into the fauces.

4. The operation of choice is occlusion of the internal carotid proximal to the sac. If this be impossible then ligation of the common carotid artery, together with a ligation of the external carotid, between its origin and first branch. If the external carotid be tied distal to a branch, that branch must likewise be occluded.

5. After ligation the prognosis is fair both as regards operative recovery and permanent cure.

6. Aneurism in other localities is by far more prevalent in the male than in the female; in the internal carotid it occurs in almost an equal ratio in the two sexes, being slightly more prevalent in the male if all types are considered, but much more frequent in the female in the spontaneous variety.

LIST OF CASES REPORTED IN LITERATURE

Spontaneous:

1 Cooper: Lectures of, 3rd Amer. Ed., 1831, ii, 62.
2. Dupuytren: Leçons orals de clin. chir., 1839, ii, 56.
3. Porter: Dublin Hosp. Rpts., 1830, v, 208, and Dublin Jl. Med. Sc., 1840, xvii, 83.
4. Porter: Dublin Jl. Med. Sc., 1840, xvii, 86.
5. Syme: Lond. and Edinb. Month. Jl. Med. Sc., 1842, ii, 961.
6. Perier: Rec. de mém. de méd. et de chir. et de phar. Milit., 1854, 2. s., xiv, 311.
7. Duke: Dublin Med. Press, 1848, xix, 65.
8. Chassaignac: Bull. de la Soc. de chir. de Par., 1859, x, 83.
9. Pircher: Wien. med. Wochshft., 1862, p. 553.
10. Godfray: Med. Times and Gaz., 1882, ii, 409.
11. Vander Veer: Trans. Amer. Surg. Assoc., 1886, iv, 253.
12. Agnew: Trans. Amer. Surg. Assoc., 1886, iv, 252.
13. Dubrueil: Gaz. méd. de Par., 1883, liv, 6. s., v, 373 and 398.
14. Wyeth: New York Med. Jl., 1883, xxxviii, 428.
15. Creus: El Genio medico-quirurgico, 1884, xxx, 191.
16. Coomes: The Med. Herald, 1885, vii, 503.
17. Hulbert: St. Louis Courier Med., 1886, xvi, 265.
18. Clementi: La Riforma Medica, 1890, vi, Part I, 478.
19. Richardson: Jl. Amer. Med. As., 1890, xv, 180.
20. Edmunds: Trans. Path. Soc. Lond., 1891, xliii, 42.
21. Polak: Weekbl. Nedrl. Tijd., 1895, xxxi, Part II, 992 and 1900, xxxvi, 1, 1213.
22. Narath: Nedrl. Tijdsft. v. Geneesk. Amst., 1903, 2. R., xxxix, 1174.
23. Mayo, C. H.: St. Paul Med. Jl., 1899, i, 751.
24. Minich: Pest. med. chir., 1901, xxxvii, 765.
25. Helferich in Werner: Deut. Ztshft. f. chir., 1902, lxvii, 595.
26. Van Campen: Nedrl. Tijdsft. v. Geneesk. Amst., 1903, 2. R., xxxix, 1172.
27. Texier: Bull. méd. Par., 1907, xxi, 593.
28. Texier: Bull. méd. Par., 1907, xxi, 593.
29. McMullen and Stanton: ANNALS OF SURGERY, 1910, li, 76.

30. Texier and Levesque: Gaz. méd. de Nant., 1910, xxviii, 466.
31. Moser: Inaug.-Dissert. Strasburg, 1911, p. 7.
32. Perthes in Keppler: Inaug.-Dissert., Leipzig, 1910.
33. Wagner in Keppler: Inaug.-Dissert., Leip., 1910, p. 14.
34. Liébault et Clavaud: Arch. gén. de chir. de Par., 1912, vi, 1436.
35. Shipley and Lynn: Jl. A. M. A., 1916, lxvi, 1602.
36. Winslow: ANNALS OF SURGERY, 1922, lxxv, p. 688.

Erosive:

1. Liston: Lancet, Lond., 1842, i, 864.
2. Neuffer: Ztshft. f. Wundaertze u. Geburtsh, 1852, iv, 206.
3. Heaton: Birmingham Med. Rev., 1891, xxx, 304.
4. Lyot and Petit: Gaz. méd. de Par., 1897, 10. s., i, 159.
5. Wulff: Muench. med. Wochsft., 1900, p. 687.
6. Johnson: Trans. Amer. Laryng., Rhin. and Otol. Soc., 1901, vii, 226.
7. Zamboni in del Fabbro: 13 Cong. intern. de méd. Par., 1900, sec. de chir. gén., x, 516.
8. Bruns in Blauel: Beitr. z. klin. Chir., 1903, xxxix, 620.
9. Hirsch: Monatshft. f. Ohr., Ber. and Wien, 1914, xlviii, 780.
10. Klarfeld: Wien. klin. Wochsft., 1915, xxviii, 1361.

Traumatic:

1. Mettauer: Amer. Jl. Med. Sc., 1849, n.s., xviii, 351.
2. Fingerhuth: Preussiche med. Zeitung, 1864, vii, 183.
3. Briggs: Nashville Jl. Med. and Surg., 1871, n.s., vii, 102.
4. Lee in Fenger and Lee: Gaillard Med. Jl., 1882, xxxv, 10.
5. Prewitt: Trans. Amer. Surg. Assoc., 1886, iv, 233.
6. Duchamp: La Loire méd., 1898, xvii, 113.
7. Booth: Phila. Med. Jl., 1900, vi, 1002.
8. Ciechomski in Lewenstern: Cent. f. chir., 1901, p. 1228.
9. Bobbio: Policlin. Roma, 1906, xiii, sez. chir., 50.
10. Morestin: Bull. et mém. Soc. de clin. de Par., 1915, n.s., xli, 2443.
11. Bouchard: Rév. gén. de clin. et de Thera. Par., 1916, xxx, 104.
12. Page in Makins: Br. Jl. of Surg., 1915-1916, iii, 378 and 404.
13. Gjurgevitch in Soubbotitch: Deut. Zeitshft. f. chir., 1914, cxxvii, 462.

Arterio-venous:

1. Joret: Gaz. méd. de Par., 1840, 2. s., viii, 457.
2. Giraldès: Bull. Soc. de chir. de Par., 1854, v, 70.
3. Keen: Med. and Surg. Reporter, Phila., 1894, lxx, 380.
4. Janssen: Kiel, 1903.
5. Cushing in Callander: Johns Hop. Hosp. Repts., 1921, xix, 301.
6. Dufourmentel: La Presse méd. Par., 1917, xxv, 50.
7. Le Fort: Bull. de l'Acad. de méd. Par., 1917, 3. s., lxxviii, 108.
8. Lannois and Patel: La Caducée, 1915, xv, 127.
9. Bland Sutton: Br. Jl. Surg., 1915, iii, 490.
10. Heuer in Callander: Johns Hopk. Hosp. Rpts., 1921, xix, 302.

Unclassified:

1. Arnould: Bull. et mém. de la Soc. Anat. de Par., 1914, lxxxix, 168; specimen found in dissecting room subject, clinical course not known.

Since submitting this article for publication, from sources previously unavailable I have collected the following additional cases of extracranial aneurism of the internal carotid artery:

Spontaneous:

37. Jianu: Revist. de Chir., Bucuresti, 1909, xiii, 536; lig. C.C.A., cured.

Erosive:

11. Vas: Jahr. f. Kindhlk., 1916, lxxxiii, 493; incised for abscess, died of hem.
12. Ransohoff: ANNALS OF SURGERY, 1918, lxviii, 152; lig. C.C.A., cured.
13. Beck: Monatshft. f. Ohrhlk. u. Laryngo-Rhin., 1918, lii, 606; no op., mortal hem. from nose and mouth, aneur. disc. only at autopsy.
14. Pusateri: Il Policlin., Roma, 1918, sez. prat., xxv, 475; no op., fatal hem. six and one-half mos. after onset of lesion.

Traumatic:

14. Pribram: Arch. f. klin. Chir., 1917, cviii, 680; lig. I.C.A., cured.
15. Pribram: Arch. f. klin. Chir., 1917, cviii, 680; lig. C.C.A., died tenth day of cerebral softening.
16. Pribram: Arch. f. klin. Chir., 1917, cviii, 680; lig. C.C.A., died third day of cerebral softening.
17. Rauchenbickler: Arch. f. klin. Chir., 1918, cx, 700; suture of proximal segment I.C.A., double lig. I.J.V., died on table, autopsied.
18. v. Eiselberg in Ranzi: Arch. f. klin. Chir., 1918, cx, 656; partial occlusion I.C.A., improved.
19. Orth: Beitr. z. klin. Chir., 1917, cv, 347; no op., final result not stated.
20. Johnsen in Gabriel: Beitr. z. klin. Chir., 1919, cxvi, 583 and 584; lig. E.C.A., died, softening of the brain, correct diag. establish. by autopsy.
21. Vegas: Rev. espan. med. and chir., 1920, iii, 379; lig. C.C.A., I.J.V., cured.
22. Bier in Kuettner: Beitr. z. klin. Chir., 1917, cviii, 6 and 43; found at autop on rt. side, also aneu. of lt. vertebral present for which lt. C.C.A. had been lig., sac incised and packed.
23. Reich: Muench. med. Wochsft., 1915, lxii, 200; simultaneous aneurisms of int. and exter. carotids, no further details.
24. Kalima: Jl. de Chir., Par., 1920, xvi, 74; lig. all carotids and sup. thyroid, excision of sac, cured.
25. Gilberti: Il Policlin., 1918, sez. prat., xxv, 557; lig. I.C.A., C.C.A., I.J.V., cured.
26. Herzen: Jl. de Chir., Paris, 1911, vii, 677, abst. from Chiurourguia, 1911, xxx, No. 177, 95 (Sept. supplement).

Arterio-venous:

11. Haberer: Arch. f. klin. Chir., 1916, cvii, 662; quadruple lig., cured.
12. Suchanek: Arch. f. klin. Chir., 1918, cx, 682; lig. I.C.A., I.J.V., imp.
13. Bier: Deut. med. Wochsft., 1915, xli, 122 and 123; vessel suture, cured, no description of op.
14. Ortenberg: Muench. med. Wochsft., 1917, lxiv, 237; lig. I.C.A., C.C.A. and vertebral, cured.
15. Gilson Hermann in Lenormant: Jl. de Chir., Par., 1921, xvii, 138; lig. all carotids and I.J.V., cured.
16. Gault in Lenormant: Jl. de Chir., Paris, 1921, xvii, 138; lig. I.C.A., tamponing of lateral sinus through an opening made in the mastoid, next day lig. C.C.A., cured.

NOTE.—Added to those previously reported, this makes a total of ninety-four examples of aneurisms of the extracranial segment of the internal carotid artery.

TABLE I.—*Cases operated on by American Surgeons.*

No.	Surgeon	Reference	Sex	Age	Side	Duration	Operation	Date	Rec.	Died	Cause of death	Type	Cause	Remarks
1	Mettauer...	Am. Jl. Med. Sc., 1849, n.s., XVIII, 351	M	25	R	6 weeks	C. C. A.	3-8-1842	....	Yes	12 days, cerebral complications	T	Puncture	
2	Briggs.....	Nashville Jl. M. & S., 1871, VII, 102	M	23	L	6 weeks	C. C. A. I. C. A.	2-23-1871	Yes	....	.....	T	Stab	
4	Wyeth.....	N. Y. Med. Jl., 1883, XXXVIII, 428	F	60	L	10 years	C. C. A. E. C. A. S. T. A.	.....	Yes	....	.....	S	No	
5	Prewitt.....	Trans. Am. Surg. Assoc., 1886, IV, 235	F	17	R	3 mos	C. C. A.	4-4-1885	....	Yes	5 days, sepsis	T	Pistol	
6	Hulbert.....	St. Louis Cour. Med., 1886, XVI, 265	F	19	R	.....	C. C. A.	.....	....	Yes	Hemorrhage and asphyxia	S	No	First lanced for abscess, no pus, diagnosis made by aspirating pure blood.
8	Agnew	Trans. Am. Surg. Assoc., 1886, IV, 252	F	...	...	8 mos	Both C. C. A. & S. T. A. L. A.	.....	....	Yes	Hemorrhage and sepsis	S	No	As the ligation of the C. C. A., S. T. A. and L. A. of the affected side did not control pulsation, the opposite C. C. A., was lig. also, despite this sac burst, hem. checked by packing but patient died later of sepsis.
11	Keen	Times and Reg., Phila., 1894, XXVII, 151	M	23	L	3 years	E. C. A. C. C. A. I. J. V.	.....	Yes	....	.....	AV	Pistol	
12	Mayo, C. H..	St. Paul Med. Jl., 1899, I, 751	F	23	R	6 years	C. C. A.	8-2-1889	Yes	....	.....	S	No	
15	McMullen .. & Stanton	Annals of Surg., 1910, LI, 76	F	60	R	1 year	Endoaneurismorrhaphy	12-29-1908	....	Yes	Secondary hem. and exhaustion	S	No	In this case a restorative endoaneurismorrhaphy was done apparently with success but the patient later died of secondary hem. These are the only American operators to attempt this character operation for aneurism of the internal carotid.
16	Shipley..... & Lynn	Jl. A. M. A., 1916 LXVI, 1602	F	41	L	.....	E. C. A. C. C. A.	1-31-1915	Yes	....	.....	S	No	
17	Cushing	Johns Hopkins Hosp. Rpts., 1921, XIX, 301	M	28	R	.....	I. C. A.	.....	Yes	....	.....	AV	Injury	
18	Heuer.....	Johns Hopkins Hosp. Reports, 1921, XIX, 302	M	48	R	.....	Band to I. C. A.	.....	Yes	....	.....	AV	Injury	
19	Winslow, N.	Annals of Surg., Vol. LXXV, 688	F	48	R	9 mos	E. C. A. C. C. A.	2-1-1921	Yes	....	.....	S	No	Physician in attendance lanced for abscess.

T. traumatic. AV. arteriovenous S. spontaneous.

TABLE II.—*Cases observed by American Surgeons but unoperated.*

No.	Author	Reference	Sex	Age	Side	Duration	Rec.	Died	Cause of death	Type	Cause	Remarks
3	Fenger & Lee	Gaillard Med. Jl., 1882, XXXV, 10	M	28	R	15 days	...	Yes	Hemorrhage, operative	T	Pistol	Mistook for abscess (Lee), lanced, died almost instantly.
7	Coomes.....	The Medical Herald, 1885, VII, 503	F	...	L	10 days	...	Yes	Spont. hemorrhage	S	No	She bled from the mouth 6 days before Coomes stuck a finger in the mouth, recognized pulsation and determined the diag. Autop.
9	Vander Veer....	Trans. Amer. Surg. Assoc., 1886, IV, 253	M	40	L	.....	....	Yes	?	S	No	On two separate occasions treated by compression, thought he had effected a cure, man returned home, died suddenly, autopsy failed to determine the cause.
10	Richardson.....	Jl. A. M. A., 1890, XV, 180	F	35	R	.....	?	?	.....	S	No	Fate not known, no treatment.
13	Booth.....	Phila. Med. Jl., 1900, VI, 1002	M	25	L	18 days	....	Yes	20 days, spont. hem. exhaust	T	Injury	Biopsy for diag., no other operation. Pathol. reported no evidence of malignancy.
14	Johnson.....	Trans. Amer. Laryng., Rhin. & Otol. Soc., 1901, VII, 226	M	4	L	10 days	...	Yes	6 months, spont.	E	Tonsillitis	First seen by Johnson, March 15, 1900, died Sept. 11, 1900. During course of disease tracheotomy for suffocation. Thought by some to be abscess.

S. spontaneous E. erosive T. traumatic

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[2] Wyeth: Trans. A. M. A., 1878, xxix, Appendix, Prize Essay.
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[4] Bobbio: Il Policlinico, 1906, xiii, sez. chir., 50.
[5] Von Bergmann: System of Practical Surgery, 1904, ii, 70 and 75. Translated and edited by William T. Bull.
[6] Giraldès: Bull. Soc. de chir. de Par., 1854, v, 70.
[7] Joret: Gaz. méd. de Par., 1840, 2. s., viii, 457.
[8] Callander: The Johns Hopkins Hosp. Repts., 1920, xix, 301 and 302.
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ANOTHER CASE OF BULLET WOUND OF THE FEMORAL ARTERY AND VEIN SUCCESSFULLY TREATED BY LIGATION OF THE ARTERY AND VEIN AND EXTIRPATION OF THE INJURED SEGMENT*

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Before this association last year and in the Annals of Surgery, March, 1921, I reported a case of communicating bullet wound of the external iliac artery and vein cured by ligation of these vessels above and below the wound; and made a study in detail of the subject of such vessel injuries. This patient's limb has remained in every way normal for two years, save that no arterial pulsation is palpable below the point of ligation.

The present report is of a similar injury slightly lower down in the femoral vessels, though clot formation had closed the fistulous communication. The case was treated by ligation of the femoral artery and vein above and below the site of injury and complete excision of the injured segment involving slightly more than an inch of each vessel. The result is perfect, there is no evidence of ischæmia of the limb, the function of the entire lower extremity is unimpaired, and, but for the absence of pulsation of the popliteal artery and vessels of the ankle and foot and the presence of the scar at the site of operation, there is no evidence that the limb has ever been injured or operated upon.

Case I.—No. 21-3780, colored woman, about twenty-five years of age, admitted to St. Phillip Hospital September 27, 1921, about 2.15 P.M., having received a pistol bullet wound half an hour before admission. The wound of entrance was in the upper part of the right thigh. There was a wound of exit on the left labium, another one of entrance into the adjacent portion of the left thigh and a final wound of exit in the outer aspect of the left thigh. The wound of entrance in the right thigh was oozing blood. There was some swelling in the right thigh, it measuring 21½ inches in circumference as compared with 18½ inches around the left thigh at the level of the vulva.

Upon admission no pulse was palpable in either foot or in the right popliteal artery. The left popliteal was palpable. An hour later pulsations of the anterior tibial and dorsalis pedis arteries were easily palpable in the left extremity but not in the right. Capillary response in the nails of the left toes was quick and normal; in the right it was slow and subnormal. Needle puncture of the left great toe gave prompt and free bleeding of red blood, from the right the bleeding was slow, scanty and the blood was blue. The superficial veins of the right foot and ankle were slightly distended. The patient complained of great pain in the entire right extremity, most severe below the knee. The toes and

* Read before the Southern Surgical Association, December 15, 1921.

foot were freely movable. There were no abdominal symptoms, the bladder was catheterized, there was no evidence of injury to the urethra or bladder, palpation failed to find any injury of the vagina or rectum.

After five hours, and a hypodermic dose of morphine, there was some subsidence of pain but still no palpable pulse in the right foot, ankle or popliteal space. There was no thrill nor bruit in the region of the femoral vessels nor in any part of the extremity.

Six hours after receiving the injury, an oblique incision was made through a clean field (surgical approach) an inch or so below Poupart's ligament. A small amount of clotted blood was removed from the tract made by the bullet; the internal saphenous vein, in the field of operation, was ligated and cut; fat, lymph-nodes and devitalized tissue were excised. The wounded femoral artery was easily identified and was occupied by a protruding clot. This was just below the origin of the profunda femoris branch. Pulsation of the common femoral was obvious in the part of the artery just below the profunda, but there was no pulsation of the profunda nor in the femoral below the point of injury. The artery below the wound was greatly reduced in size. The pulsating common femoral artery was held up on an aneurism needle to have the bleeding under complete control, the clot was removed, free bleeding occurred immediately, and it was noted that the profunda also pulsated after removal of the clot. The femoral artery was clamped just below the profunda branch and well below the bullet wound. The injured segment (about an inch) was excised. Both ends of the femoral artery were ligated.

Up to this time we had not recognized the wound of the vein. From a study of the subject last year we believed, however, that the companion vein should be ligated whether injured or not in a case necessitating ligation of a large artery. Upon examination of the vein it was found that this was also injured and contained a large clot. After removing the clot and clamping the vessel above and below the injury, about an inch of the femoral vein, including the stump of the previously ligated internal saphenous vein, was removed. When this was done there was seen to be a bleeding vein underneath the femoral (evidently a communicating vein) and this was tied. After trimming away the ragged devitalized tissue in the neighborhood, tying small bleeders, getting the wound completely dry, the skin wound was sutured completely without drainage. The other skin wounds of exit and entrance of the bullet were excised and sutured and the patient placed in bed and the right extremity surrounded with abundant external heat.

Convalescence was normal until the fifth day. At this time she had fever of 102° and some swelling of the thigh. Just above the level of Poupart's ligament there was a soft and fluctuating area. The stitches were removed and there was no visible pus even from the suture holes. Through an aspirating needle into the soft swelling above the operation wound, clear amber fluid resembling lymph was removed. This was thoroughly cultured and found sterile. Swelling and fever persisted several days, and though we were never able to get yellow pus nor a culture of bacteria, we believe there was slight wound infection.

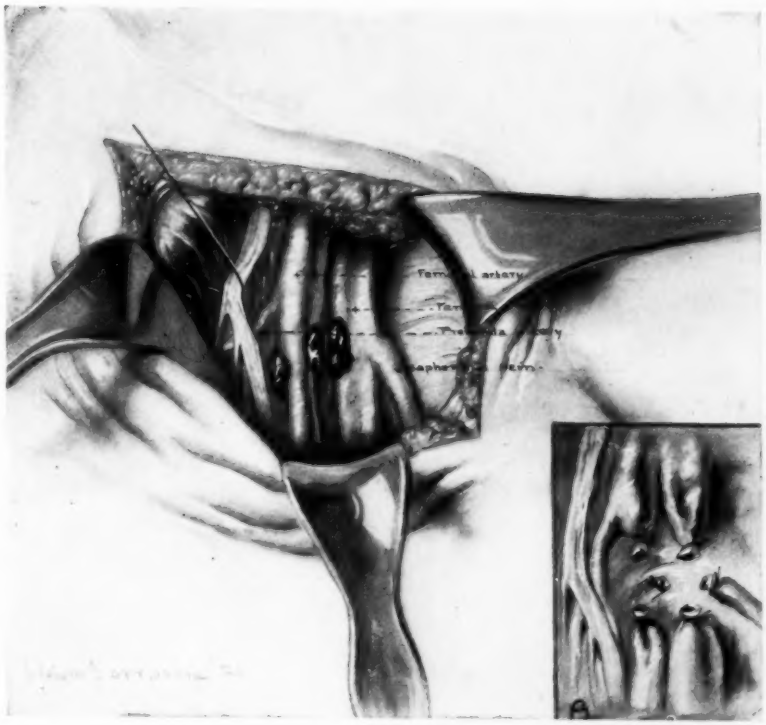

FIG. 1.—Bullet wound of the femoral artery and vein. Insert shows the appearance after ligation of vessels and extirpation of the injured segment.

The woman was discharged after three weeks, walking about and with no disability of any kind. Examination eleven weeks after operation found the extremity in every way normal, except that I was unable to palpate any arterial pulse below the point of operation.

A distinguished American surgeon is quoted as having prayed to be delivered in time of illness from the care of a doctor who has had *a case*. Might he not with equal fervency pray to be delivered from the surgeon whose opinions are firmly fixed after a successful operation upon another case?

When one studies the broad principles involved in the treatment of the immediate and remote effects of injuries of large blood-vessels and the results of isolated and collected cases treated in different ways throughout the world, one can scarcely escape the conviction that for arteriovenous lesions of the external iliac or femoral vessels the proper treatment consists of aseptic excision of the wound or lesion and all that this implies; in other words, ligation of the artery and vein above and below, and extirpation of the involved segment. The large number of cases of arteriovenous fistula on record and the monumental contributions of that great truth finder, W. S. Halsted, leaves little room for doubt that this is the proper treatment for arteriovenous wounds of this character and location and for arteriovenous aneurism or fistula.

NOTE.—I am permitted to say that during October, 1921, I saw Dr. Mont Reid, of Professor Halsted's clinic at Johns Hopkins Hospital, perform exactly this operation upon two cases of arteriovenous fistula of the subclavian vessels, and in both cases the results were perfect cure of the fistulæ and a perfect circulation in the extremities. These cases with others involving other vessels will be reported by Doctor Reid.

THE VALUE OF DAKIN'S SOLUTION IN THE TREATMENT OF ACUTE AND CHRONIC OSTEOMYELITIS

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In this communication the discussion will consider only those ordinary cases of acute and chronic osteomyelitis which are due to the common pyogenic bacteria, especially the various strains of staphylococci and streptococci. No case due to infection with the tubercle bacillus, syphilitic virus, or other extraordinary cause is considered. Cases of osteomyelitis due to infection with the typhoid bacillus can, from the surgical point of view, be classed with those due to staphylococci and streptococci.

Sufficient time has now elapsed since the establishment of the antiseptic (Carrel-Dakin) method of wound disinfection to enable a fairly accurate judgment of the real value of this method in the post-operative treatment of acute and chronic osteomyelitis. Especially important is the determination of the possibilities of this method in the prevention, or, at least, in the diminution of the frequent recurrences to which osteomyelitis is subject.

For a proper understanding of the subject under discussion a review of some of the underlying essential characteristics of osteomyelitis—its pathologic phenomena, its methods of treatment, the vagaries to which its healing is subject and the causes which frequently determine the non-healing of the wound—is necessary.

For practical purposes acute pyogenic inflammations of bone can be divided into (1) the group in which the major part of the process lies on the surface of the cortex and between the latter and the periosteum; (2) the group in which the process is fairly limited to the bone medulla; and (3) the group in which the bone is diffusely involved. In practical surgery the cases in group 3 have many similarities to those in group 2.

1. The cases in the first group—the so-called subperiosteal abscesses—are characterized by a suppurating focus between the cortex and the periosteum with little or no, permanent damage either to the layers of the periosteum or to the superficial layers of the cortex. When the abscess has been properly incised and drained the usual course of affairs includes a fairly prompt retrogression of the process and a healing of the wound within a reasonable length of time. In exceptional cases the little damage to the cortex results in the sequestration of a small fragment of dead bone which impedes the healing only in an inconsequential degree until the fragment is extruded. Subsequently it is very uncommon to have any further trouble from the focus. Subperiosteal abscess of this kind has many resemblances to abscesses in the soft parts of the body.

2. Medullary osteomyelitis is limited to the medullary cavity of the bone. In acute infections it is almost certain that the process involves primarily the entire medullary cavity and becomes limited later, if at all. Abscess and granulation tissue take the place of the normal medulla. Thrombosis of the vessels is an important part of the lesion. In only a very small minority the process finally localizes itself into a comparatively small, well-demarcated focus, which it is fairly easy to drain completely, or to excise in toto. Then, healing, under the proper care and environment, proceeds as it should from the bottom of the cavity and the latter, once it has cicatrized, remains closed permanently. These are the exceptional cases. Several distinct foci in a single bone can form in this way.

In clinical surgery the remaining cases, composing by far the greatest majority, are known: (*a*) by a lack of macroscopic characteristics which are sufficient to enable the competent operator to accurately make out the limitations of the process; (*b*) by the tendency to sequestrate necrotic bone; (*c*) by the tendency to retain foci of infection; (*d*) by the difficulties in healing especially those due to mechanical causes; (*e*) by their many recurrences.

The frequency with which a blood infection is associated with an acute bone infection is an important factor in our problem. The local focus in the body continuously attracts to itself bacteria circulating in the blood. It is not always necessary for a demonstrable bacteriæmia to be present; there are many cases—commonly known to everybody—in which several foci in widely separated regions of the body have developed subsequently to one another. In these the mechanism has, undoubtedly, included the presence of bacteria in the blood, but, nevertheless, the latter are not demonstrable in the blood cultivations.

3. Group 3 contains the cases which are probably always due to a localization following a general blood infection. It includes the cases with abscess between bone and periosteum as well as in the bone itself and those in which an entire shaft dies and sequestrates.

It is important to remember that it is not always possible to distinguish infected from non-infected bone tissue when operating for osteomyelitis. In the acute cases this is especially true. If the bone be opened in a sufficiently early stage of the disease there may be difficulty in recognizing that any infectious process is going on; and in any case of acute osteomyelitis it is not possible to outline accurately where the diseased area begins or ends and where it approximates to healthy tissue. The difficulties are made greater by the fact that the thrombosis of the vessels, which necessarily accompanies the inflammatory process, extends to a greater distance than that macroscopically visible in the actual diseased area. Under such conditions the possibility is always apparently present for the process to spread and for further destruction of bone to go on. When the thrombus is sterile the latter takes place

because of the deprivation of blood supply. When the clot is infected the process may extend because of the growth of the infection. The operative trauma itself undoubtedly causes the death of certain portions of bone tissue and probably this disability aids and abets the sterile or infected thrombus in extending the process subsequent to the primary operation. In one patient the physical appearances of the additional bone destruction almost made it appear as if a new focus had developed close to the primary one. The notes of this patient follow:

> In a young girl an acute osteomyelitis developed in one ulna. The process seemed limited and a radical osteotomy was immediately done; the wound was then packed wide open. On the tenth day the packing was removed and the lips of the wound strapped together. Agglutination of the wound surfaces rapidly took place and the wound apparently healed with exception of a superficial sinus. Two weeks later the wound became reddened and inflamed and an X-ray picture showed that at one extremity of the osteotomy the process had spread further down and that a sequestrum had formed (Fig. 1).

FIG. 1.—Tracing from X-ray picture before secondary operation. A, site of primary osteotomy: B, site to which process spread with sequestrum: C, involucrum.

In clinical surgery this accounts for the practical inability to do a radical osteotomy and to remove all of the diseased tissue in all but an exceedingly small number of the cases of acute osteomyelitis. Such a state of affairs has led many men to advocate doing only a drainage operation at the first sitting and to reserve for a subsequent opportune moment the radical operation. By the time of the latter it is hoped that the infection will have been controlled and that the diseased area will have become sharply demarcated from the healthy tissue even to the extent of a complete separation of the dead bone as a loose sequestrum.

Chronic osteomyelitis and the persistence of bone sinuses are due to several broad causes: (1) The persistence of infected areas of bone; (2) the retention of sequestra; (3) the presence of mechanical conditions which do not permit closure of the wound; and (4) the presence of complicating conditions.

1. Infection may persist, first and foremost, in small infected thrombi in the vessels of the immediate neighborhood of the diseased area. This is a very important item. As already previously referred to, these sources account for the spread of the process to other areas of the same bone, for blood infections and for secondary foci appearing elsewhere. They are

almost impossible to eradicate as any excision is almost certain to be followed by new thromboses.

Infection may persist in small foci, containing a few bacteria, retained in the depths of the scar tissue with which the wound cicatrizes, in the granulations of some of the cells of the cancellous bone or in small pockets of the wound which are formed by premature adhesion. They may lie quiescent for long periods of time and light up for no apparent reason or because of some trauma.

2. The retention of sequestra is very common. It is a frequent finding, also, for the sequestrum to make itself perceptible at a comparatively late period.

3. Mechanical conditions in the wound are the most important reasons for the failure of an operated case of osteomyelitis or for a bone sinus to heal. Among them one distinguishes the following:

a. In a certain number a bone abscess is present which drains into the soft parts through a small perforation. Insufficient drainage being present, the wound naturally does not heal.

b. In some of the latter group an osteotomy has already been done, but at the secondary operations it is found that the area of bone excised does not include the perforation in the cortex.

c. In other cases a canal is present, passing directly from one to the other side of the limb and lined on two or more opposing sides with bone. An uncollapsible sinus results. This is but an exaggeration of group *b*. Commonly this is due to new bone formation produced from the osteogenetic layers of the periosteum where the latter has been lifted away from the cortex at the primary operation.

d. In some a large bone cavity is present of such extent that it is difficult for the walls to collapse sufficiently for cicatrization to take place. Various plastic operations are frequently found necessary to secure healing.

All of these groups are characterized by mechanical conditions which do not permit healing even if the wound be absolutely sterile.

4. Cases in which some complicating condition deters the healing. I refer especially to those in which joint involvement takes place. The joint discharges find their way out through some hidden direct or tortuous path, which frequently is also difficult to expose, into the region of the infected bone or into the wound and serve as a constant source for the reinfection of the latter. This is a very important cause for the persistence of osteomyelitis wounds.

The unoperated chronic bone abscess forms a group by itself. They result from those untreated simple foci described previously in this communication. It is important to distinguish two varieties. In one because of the long duration of the focus of suppuration, the bacteria die and a sterile abscess results which, when properly opened and emptied, can be closed completely by suture with subsequent healing per primam. In the other the

bacteria persist—even though in a much depreciated condition of vitality—and drainage is necessary. The latter type of case then conforms itself in its characteristics of healing to any of the groups previously described.

The factors which determine the efficacy and success of the antiseptic (Carrel-Dakin) method of wound sterilization include: (1) The removal of all sources from which continuing or repeated reinfection can take place; (2) complete asepsis in the dressings; (3) rigid attention to detail; (4) chemically correct solutions; (5) intimate contact between the infected surfaces and areas and the antiseptic solution. In acute and chronic osteomyelitis these factors display the following characteristics:

1. In cases of acute osteomyelitis the complete removal of all sources from which continuing or repeated reinfection can take place is possible in only a very small minority of the cases in which a sharp localization of the process has occurred. Only in the latter can the diseased area be completely removed. A shallow wide wound results from the operation in which the Carrel tubes can be well disposed and in which the Dakin's solution can be adequately instilled. Sterilization of the wound surfaces is possible under such conditions. As soon as the wound is sterile its edges can be sutured together with an expectation of permanent healing.

It is possible to suture such a simple wound after sterilization before the bone tissue, which has been bared by the chiselling, has been covered with granulations. I illustrate with the notes of the following case:

> In a young girl with an acute osteomyelitis of the femur, a typical osteotomy and drainage was done and thereafter the wound was treated with Dakin's solution according to the technic described by Carrel. At the end of a week's time the wound was sterile but much bare bone was still present in the bottom of the wound. It was nevertheless sutured after the bone cavity was permitted to fill with extravasated blood. The wound was entirely healed on the fourteenth day and has remained healed up to the present.

In the other cases of acute osteomyelitis the very nature of the pathological process precludes these possibilities. The previous part of this discussion indicates that it is frequently impossible because of lack of recognizable characters, to completely remove the diseased tissue, to guard against the formation of subsequent sequestra, to remove completely all infected thrombi, to prevent or control blood infections—all of which are potent and potential causes for the continued reinfection of the wound. So that from the very nature of things the antiseptic method cannot be successful in the greatest number of cases of acute osteomyelitis.

In discussing the reasons for the failure to heal or for the many recurrences in cases of chronic osteomyelitis, I pointed out that they were essentially of a mechanical nature or were caused by uneradicable foci of infection. In the first of these two the use of Dakin's solution cannot improve the mechanical conditions present. In the second, the structure of bone tissue

prevents the successful intimate contact between solution and infected area—be the latter in the cells of the cancellous bone or in the thrombi—and the method does not succeed in sterilizing the infection. In either case it appears that radical surgery is primarily needed to remove completely these faults in structure or to eliminate entirely the infected tissue, both of which desiderata are essential to the correct and successful technic of the antiseptic (Carrel-Dakin) method.

In neglected cases with complicated sinuses, or with comparatively large cavities in the soft parts or within the bony tissue, the sinuses and cavities become filled with soft masses of badly looking granulations in which bacteria of all kinds flourish abundantly. No antiseptic solution can successfully cope with such an infection existing as it does both on the surface and in the depths; so that, again, the antiseptic method cannot be successful until all of such tissue be completely removed.

Great difficulty is found in a group of cases in which apparently the mechanical conditions for healing seem to be in a satisfactory condition but in which, nevertheless, healing does not take place. I have had cases of this kind in which the bone was covered amply with granulation tissue which was apparently in healthy condition, and in which no bare bone could be discovered anywhere. I have had other cases in which the walls of the cavity were formed, either in whole or in part, by bared bone tissue which was continuously crumbling from a molecular necrosis. Dakin's solution seems to have no effect. Simple curetting of the bone does not seem to have any permanent effect and rather soon the process repeats itself. The trouble seems to be a persistent infection. A radical removal well into healthy tissue is the only procedure that is of value with or without some plastic procedure.

In both acute and chronic osteomyelitis the presence of the complications noted previously defeats the purpose of the antiseptic (Carrel-Dakin) method unless the source can be eliminated. In osteomyelitis these are essentially (1) a communicating undrained or badly drained joint and (2) a blood infection. An undrained or badly drained joint plays the same rôle in osteomyelitis that a communicating broncho-pulmonary fistula does in empyema thoracis; each must be corrected before any sterilizing effect can be exercised by the antiseptic solution. Up to the present there is no adequate method of controlling any blood infection.

2. A very rigid attention to asepsis in the dressings of the wound is naturally extremely essential. It is futile to make use of an antiseptic solution if with each dressing the wound is contaminated anew from the outside.

3. A rigid attention to detail is also essential. All of the factors indicated as being necessary to the proper performance of the Carrel-Dakin technic are essential and any deviation, however slight it may be, causes a breakdown of the entire method.

4. Chemically correct solutions are necessary.

5. An intimate contact of antiseptic solution and area to be sterilized.

It is necessary that the solution have the requisite content of chlorin. In

bone wounds the added difficulty exists that the chlorin must penetrate to a fair distance into the cancellous bone besides covering the surface. The sterilization of one of these two without that of the other will not be sufficient and I have no doubt that one of the important causes why the method fails in some of the bone wounds which have been adequately and correctly prepared is the inability of the chlorin content to penetrate sufficiently deep. There is the further added possibility that the chlorin content of the antiseptic solution may have been dissipated or evaporated from the solution by the time the penetration has occurred.

It is usually said that an absolute sterility of the wound, as determined by the various methods recommended—both smear and culture—is not necessary for the final stage of the Carrel-Dakin technic, namely, for the secondary suture. In bone wounds resulting from osteomyelitis this is especially true. It has repeatedly been possible to suture the wounds secondarily when smears and cultures show that a minimum number of bacteria are present (one organism to three to five microscopic fields in the smear). This, however, corresponds very accurately with the possibilities that are present when the technic is not employed. I have had quite a number of cases in which after the requisite thorough osteotomy the wound was packed wide open and allowed to granulate under the packing until the surface was very healthy looking to the naked eye. Then the lips of the wound were strapped together with adhesive and the wound was left undisturbed for from seven to ten days. At the end of that time it was found entirely healed, or with only a superficial scabbing where the approximation had not been perfect. Smears taken from these wounds at the time of the strapping showed that organisms were present, and, in many of them, their number exceeded that accepted as the orthodox minimum for the secondary closure after the use of Dakin's solution.

On the other hand, the retention of these very few bacteria may account for a certain number of the recurrences. For the bacteria, few as they are, when encysted in the tissues of the wound, are liable under the proper stimulus to assume a renewed activity and cause a subsequent suppuration and reopening of the wound. The latter sequela is possible, naturally, with or without the use of Dakin's solution, and I have personally had experiences with each showing that, at least in this regard, the Carrel-Dakin method has no superiority in osteomyelitis wounds.

For the purposes of this discussion and for my deductions I shall assume that the technic of the antiseptic (Carrel-Dakin) method is properly and efficiently employed as far as is humanely possible. Under these conditions it behooves one to take cognizance of the sources of failure, which are inherent because of the nature of the diseased process in a tissue as peculiar as bone, or because of its accompanying blood infections, in the limitations of one's operative technic in bone tissue, in the disabilities which are present because of associated complications—notably the joint infections—or to other conditions which can secondarily appear during the course of the healing,

as well as of the possibilities which are present when the antiseptic (Carrel-Dakin) method is not employed.

From the foregoing analysis of the clinical conditions it seems, therefore, that in actual practise the antiseptic (Carrel-Dakin) method of wound treatment, as an adjunct in the post-operative treatment of osteomyelitis has but a limited use. The method is useful in only the simplest of the acute cases, in those of small size, in those subjected to an immediate radical osteotomy and in which no further spread of the infection and no subsequent necrosis of bone appears, in those in which the operative wound has a simple contour and is uncomplicated with complex sinuses. In the chronic cases the same may be said only when the conditions approximate those of the simple uncomplicated acute cases.

The method is not successful in any case, either acute or chronic, in which the infection is not entirely eradicated, in which there are adverse mechanical conditions (bone cavities, sinuses or canals) which do not permit cicatrization under any condition, in which complications (joint infections) coexist which are not properly cared for, or in the presence of acute and chronic blood infections.

It seems further that osteomyelitis cases in order to be properly prepared for the correct use of the antiseptic (Carrel-Dakin) method must be subjected to radical surgery in the maximum degree in order to obviate the inherent disabilities outlined previously which by themselves would hinder the healing. After such efficiently done radical operations the wounds resulting must needs have a simple outline and a regular contour and they usually permit an immediate obliteration of the wound cavity by the proper provision and placing of the adjacent soft parts. Under these conditions the antiseptic (Carrel-Dakin) method is superfluous; for, when the after-treatment is properly carried out and one gives an equal attention to the detailed care of the wound, it is possible within a comparatively short time (in my own experience within seven to ten days) to strap, or suture, the lips of the wound together with the confident expectation that an agglutination of the wound surfaces will take place and an efficient healing will follow which equals, in its rapidity and permanency, that obtained after the primary suture of an uninfected wound, and many times exceeds in rapidity that obtained after the use of the antiseptic (Carrel-Dakin) method.

It follows, also, that, other things being equal—as outlined in the previous paragraph,—the antiseptic (Carrel-Dakin) method has not, in my experience tended to give a shorter period for the healing and convalescence.

Under any condition the antiseptic (Carrel-Dakin) method has not seemed to give any assurance that a recurrence of the bone lesion will not subsequently take place. The healing of any bone wound is beset with many opportunities for the retention of dormant foci of infection or for small aseptic sequestra, or for other factors which are always competent under the proper stimulus and environment of causing secondary inflammatory reactions in the neighborhood of the original wound. These sources seem, at the present writing,

to be beyond human powers of prevention. In this regard there does not seem to be any difference in result between the ordinary and the antiseptic (Carrel-Dakin) methods of after-treatment. The notes of the following case will illustrate this point:

> The patient was operated upon many times for an osteomyelitis of the femur. At the last one, a very radical osteotomy was done and at its conclusion the wound seemed ideally suited for the antiseptic (Carrel-Dakin) technic. This was instituted; the wound was very promptly sterilized and secondarily sutured. The wound then healed at once and it was hoped that it would remain healed permanently. However, our hopes were not realized; the wound remained healed for a number of months only; then a small sinus formed. An X-ray picture, taken after the injection of bismuth, showed that there was a large cavity and a probe demonstrated the presence of much bare bone.
>
> There are other foci in this patient, one especially in the opposite femur which had not been treated with the antiseptic (Carrel-Dakin) method. As far as recurrences go, there has been no perceptible difference between any of them.

Closure of the operative wound in acute and chronic osteomyelitis occurs very often as a temporary phenomenon. This can be a matter of a few days, or one of weeks or months. Indeed closure of any wound resulting from any osteomyelitis is commonly accepted as such and its reopening at some subsequent time is taken almost as a matter of course in medical circles. Nature's attempts at compromise are so marked that superficial healing is many times permitted to take place before the deep parts of the wound and its adjacent tissues are quite ready. It is most important to remember this.

SPIRAL FRACTURE OF THE TIBIA AND FIBULA*

By John A. Caldwell, M.D.

of Cincinnati, Ohio

Practically all text-books of surgery mention spiral fractures of the tibia and fibula in a manner to note that such fractures occur and that the ends of the fragments are oblique, but rarely is one given to understand that such fractures have a definite mechanism of production and constitute a peculiar problem in reduction and fixation. Failure to appreciate the classical picture of this fracture has led to much mal-union, refracture and deformity and entailing economic loss and has furnished the reason for this report.

The spiral fracture is always produced one way. While the patient is walking and his weight is on the injured leg, he is thrown off his balance, and in endeavoring to regain his equilibrium he twists his leg while bearing his weight on it. This movement breaks the tibia in the lower third and the fibula somewhere in the upper third—the line of fracture being spiral (Figs. 1 and 2). A very complete qualitative and quantitative analysis of the forces operating in producing spiral fractures has been made by Rixford.[1] Since the line of fracture in the tibia is oblique, the weight of the body forces the fragments past each other, causing the entire body weight to be borne on the fibula and sometimes impacting the fracture in it firmly.

When first seen a fracture of the tibia is usually diagnosed with ease. The deformity, mobility and ecchymosis at the site give conclusive evidence of a fracture, but the slight preternatural mobility of the tibial fragments may give rise to the error that the tibia alone is broken. A radiogram of the lower leg only will reveal no fracture in the fibula, but will almost invariably show slight overriding and lateral displacement of the tibial fragments, which is conclusive evidence that the fibula must be broken somewhere outside the field of the radiogram. If a second plate be taken showing the leg from the knee down, the fracture of the fibula will be seen within the first three inches from the head. This fracture can also be predicted by the point tenderness below the head of the fibula. If an attempt be made to overcome the overlapping of the tibia by traction under the fluoroscope, one is soon shown the futility of such attempts. In some of my cases I have given an anæsthetic and placed the leg in a Thomas splint, the end of which I braced against my chest so that I could make effective counter-pressure. With all the traction I could bring to bear, meanwhile watching the fragments under the fluoroscope, I have never been able to extend sufficiently to permit the overlapping tibial fragments to come together.

In one case in which operative treatment was refused, I imbedded the prongs of ice tongs just above the malleoli and heavy continuous traction

* From the Surgical Service of the Cincinnati General Hospital.

was made for several days, when a second radiogram showed no improvement in the relative positions of the two oblique surfaces of the fracture of the tibia. I have become convinced that in the common type of spiral fracture of the tibia and fibula the fracture of the tibia is not reducible by any conservative means. If any doubt of this remained it would be dispelled by the difficulty one encounters when he operates on spiral fractures. In such cases the only procedures which have been attended with success have been either an osteotomy of the fibula on a level with the fracture of the tibia where the lower fragments of the tibia can be pulled down, or Lowman clamps are applied to the two fragments of the tibia, and these are forced apart with a Gerster turnbuckle.

Since reduction of a spiral fracture is in every case within my experience impossible, the surgeon has the two alternatives of permitting union to take place with the fragments of the tibia in greater or less malposition, or performing an open operation. If the first course is followed union will practically always follow but function will be delayed, for the following reasons:

1. Since the fracture is oblique and reduction with engagement of the ends is impossible, weight-bearing must be withheld until firm bony callus is formed, a period of at least eight weeks.

2. The prolonged fixation of the ankle necessary in splinting the fracture will result in more or less temporary ankylosis of the joint and some time must elapse before a comfortably movable and useful joint can be obtained.

If firm union results there is always some shortening, not less than one-fourth inch, and rarely more than three-fourths of an inch, but in either case it is sufficient to cause a temporary limp until the patient can learn to compensate. Then since the fracture line is long and the ends not accurately coapted, union must depend on a large quantity of callus, and this causes a permanent swelling low in the ankle where it frequently interferes with the fit of the shoe. For the above reasons I have come to regard open operation as the best means of assuring the patient the earliest return of a functioning limb and a perfect final result, and this type of break suggests one of four methods of fixation: (1) Plating. (2) Intramedullary dowel. (3) Bone screws. (4) Banding. Plating has undoubtedly become the most commonly used method of open fixation, but is objectionable here because it necessitates placing a rather large mass of metal beneath skin only where subsequent injury may cause ulceration which may expose the plate. Then since screws in bone loosen easily, external splints must also be used, which temporarily fix the ankle-joint.

The intramedullary dowel is a certain means of fixation and its use in this type of fracture has been strongly advocated by Davison.[2] In his procedure he does an osteotomy of the fibula in order to obtain the necessary mobility of the tibia for reduction and emplacement of the dowel. This necessitates an extra incision and makes a second fracture to unite. To mobilize the tibial fragments sufficiently to insert the dowel considerable

FIG. 1.—Case IX. F 2435. Spiral fracture of tibia. Fracture of fibula as usual does not show in radiogram taken of tibial fracture, but the shortening of one-half to three-fourths inch indicated by radiogram is proof that the fibula is broken at some point.

FIG. 2.—Case IX. F 2435. Radiogram taken same time as Plate I, showing fracture of fibula just below knee.

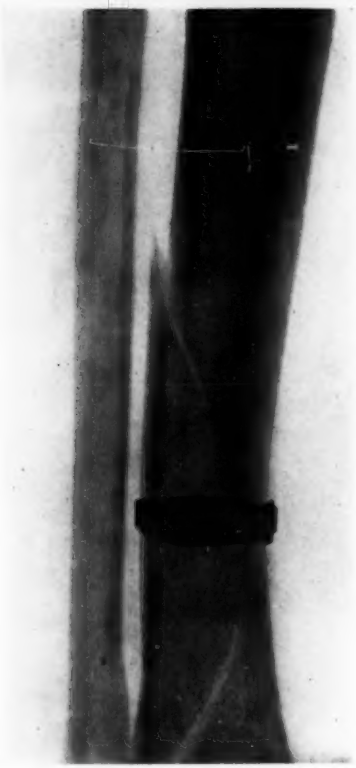

FIG. 3.—Case IV. F 2749. Plate 2. Taken after band was applied. No splint was applied, but leg was laid in a wire basket for ten days. In eight weeks band was removed at which time patient was walking comfortably.

trauma to soft tissue is necessary. Then finally a cast or other means of external splinting is necessary.

The bone screw as popularized by Henderson [3] is an excellent means of bone fixation and is well adapted to this fracture, provided there is no splitting or comminution of the lower fragment. This complication renders a screw unsuitable. It is also open to the objection that outside splinting is required.

To my mind the ideal means of holding the fragments in the spiral fracture is the Parham-Martin band [4] (Fig. 3). A light band, applied tightly after a perfect reduction, will hold fragments so firmly that no cast or splint need be applied and the ankle-joint can be moved as soon as operative soreness has subsided. The band can be applied with the minimum amount of trauma to soft tissue and in a shorter time than any other fixing device. I have now banded ten of these fractures in the past two years and I feel that by this means the period of disability is shortened, and, because the coaptation of fragments is absolutely accurate, union takes place with the minimum amount of callus, so that no swelling of the ankle results.

Since I have been convinced that any attempt at disengaging the impacted ends of the fractured fibula is futile, I make no attempt at reduction or improving overlapping or malposition of the tibial fragments before operation. The pre-operative period is about ten days, at which time swelling has begun to subside and phagocytosis is well established. During this period a well-padded basket splint or Stimson dressing is applied and the leg is kept well elevated. Every effort should be made to maintain the integrity of the skin because vesication or maceration absolutely necessitates postponement of the operation.

The operative technic pursued is as follows: I do not use a constrictor, for I feel that while it makes the operation easier, one often has deep and troublesome bleeding after the operative steps are completed and a hæmatoma may result. After the skin incision is made the knife used is discarded and the undraped skin is covered by towels clamped to the wound margins. After the bone is exposed and the muscle freed, Lowman clamps are applied with a Gerster turnbuckle between them and the fragments are forced apart and placed in perfect position and are held there with Lane bone forceps. I have had made an instrument for passing a Parham-Martin band which I have found a great convenience and time-saver (Fig. 4). It resembles a right-handed aneurism needle in which the blade is about one-half inch wide and is chanelled on the concave surface with a channel wide enough for the band to pass easily. This instrument is passed around the bone and the band is pushed through the channel, the Parham-Martin instrument is attached and the band is drawn tight and cut off.

I always advocate the removal of the band in two or three months. This can easily be done under local or gas anæsthesia and requires not more than

one or two days hospitalization. Most of my cases have not accepted this advice and have continued to wear the band without inconvenience. I believe that a plate or band on the tibia is best removed after it has served its purpose, because it is in a position where the overlying skin is easily injured and an injury may cause ulceration to the metal and deep infection may result.

I have treated ten cases of this type in the past two years; of these, two have refused operation, and their subsequent history and present state makes a valuable contrast to the operated cases. In one operated case fulminant infection developed within twenty-four hours, necessitating complete reopening of the wound and removal of the band. This patient finally got a good result. In one case a bone screw was used, and after it was inserted it was discovered that it was fastened in a partially detached fragment and a band was applied in addition. This patient was a pronounced alcoholic, and while the operative result was perfect, operation was followed in two weeks by pulmonary embolism, which was succeeded in turn by left crural phlebitis, then

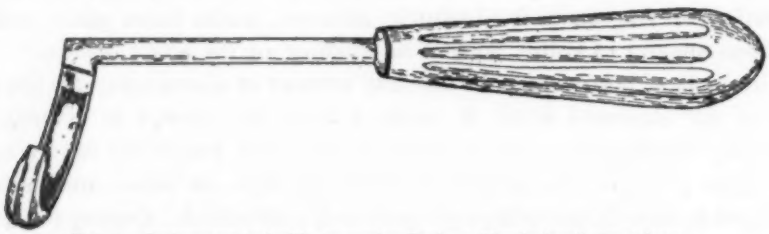

FIG. 4.—Instrument to facilitate passing Parham-Martin band about bone.

a similar phlebitis on the right side and then a second phlebitis on the left. He finally left the hospital in four months with no impairment other than slightly œdematous legs.

Here follows a brief abstract of the history, course, treatment and results of the ten cases. All cases reported were from the surgical service of the Cincinnati General Hospital, where the patients are all indigent and have no fixed homes—consequently I have been able to obtain late observations in but seven. However, in the three cases in which late record is missing, the hospital residence was long enough to enable a final outcome to be predicted with fair accuracy.

In the series were two surgical mishaps. In the case in which pulmonary embolism and phlebitis followed, sepsis, the only known preventable cause, was absent, for the course of wound healing was aseptic. The one case of infection was a true surgical catastrophe, one of the sort which is possible in every open bone operation and which to some extent justifies the stand which many surgeons take against open bone work. The cause of the infection was not ascertainable. The operation was not difficult and was one of the late ones of the series, so that technic was established and the work was done in unusually short time. I mention these points particularly to emphasize the ever-present peril of infection where a bone is exposed. To reduce this peril to its least liability, I insist on the following technical points as

essential: (1) Minimum trauma of soft tissue. (2) Elimination of possibility of indirect contact with patient's skin by wound guarding. (3) Avoidance of hand contact. (4) Short operating time—probably the most effective preventive of infection.

RECORD OF OPERATED CASES

CASE I.—D 7051, W. C. Male, aged forty-seven. Injured October 29, 1919. Radiogram shows spiral fracture of the tibia in the lower third and fibula in the upper third. A Thomas splint with extension was applied. Shortening one-half inch. Operation November 11, 1919—Parham-Martin band applied and leg was splinted with a plaster cast.

December 9, 1919, band was removed, at which time union was firm. This patient has been seen repeatedly since the operation and he has had perfect restoration of function and no discomfort.

CASE II.—E 752, M. M. Female, aged twenty-eight. Slipped on an icy pavement January 26, 1920. Radiogram shows typical spiral fractures of tibia and fibula. Operation was refused but ice tongs were imbedded just above malleoli on January 29, 1920, and extension was made by Thomas splint. On February 3, 1920, the tongs were removed because radiogram showed no improvement in position of fragments and a cast was applied. On February 19th, patient left the hospital against advice and I saw no more of her till October, 1921, when she called to see if something could not be done to relieve the pain she suffered in the injured leg. She stated that she had not been able to resume her position as saleswoman till September of the year she was hurt and since then she required frequent rest and relief from her work in order to work at all. At this time the radiogram showed firm union with moderate callus and good position but marked atrophy from disuse. There was still one-half inch shortening.

CASE III.—E 2409, S. B. Male, aged fifty. Admitted March 20, 1920. The X-ray shows a spiral fracture of the tibia in the lower third with fracture of the fibula in the upper third. This patient refused operative treatment. Fluoroscopic reduction was ineffectual and Stimson plaster dressing was applied. On leaving the hospital May 6, 1920, the following condition was noted. Shortening one-half inch. Movements of ankle joint restricted (on account of inclusion of ankle in cast). The ankle was considerably enlarged by deposit of callus and there was slight eversion of the foot. There has been no later observation of this patient but he is reported to walk with a slight limp.

CASE IV.—E 2749, H. E. Male aged forty-eight. Was injured March 30, 1920, in a motorcycle accident and admitted the same day. There were typical spiral fractures of the tibia and fibula and in addition a second fracture of the fibula at the same level as the break in the tibia. A Parham-Martin band was applied April 8, 1920, and the leg was kept in a basket splint one week, after which time the patient was allowed up in a wheel chair. He left the hospital April 28th, with quite firm union. On June 13th, the band was removed under short nitrous oxide anæsthesia. At this time contour of ankle was normal, union was firm and the patient got about without discomfort.

CASE V.—E 3176, O. S. Male, colored, aged forty-nine. Admitted April 15, 1921. Radiogram showed typical spiral fractures of tibia and fibula and measurement disclosed shortening of three-fourths of an inch. A band was applied April 22, 1921, and leg was placed in a basket splint.

Patient was discharged May 24, 1921, at which time there was firm union. He did not return for removal of the band as directed. He was seen and examined

November 17, 1921, at which time the leg and ankle were normal save for a slight lump at the site of the band. There was no functional impairment.

CASE VI.—E 8137, M. R., aged forty-nine. Patient was admitted intoxicated November 20, 1920. Radiogram showed typical spiral fractures of tibia and fibula. Operation November 29, 1920. The plan was to secure fragments with a bone screw. After this was inserted and drawn tight it was discovered that a loose fragment only had been secured to the upper end. Complete fixation was then made with a Parham-Martin band. Convalescence was satisfactory till December 23, 1920, when patient complained of severe pain in right lower chest. A pulmonary embolus was diagnosed. On January 4, 1921, he developed a severe phlebitis in the left thigh, which gradually subsided and was succeeded by a similar condition in the right thigh and later a second attack in the left thigh. During this time the wound had shown no sign of infection and had healed by primary union. The patient was bedfast till April 8th, on account of the swelling in his legs. He was discharged April 8th, the swelling in his legs being controlled somewhat by dressings of gauze and Unna's paste. Union was quite firm and there was no deformity.

CASE VII.—F 661, M. B. Female, aged thirty-six. This patient was alcoholic and quite obese. She was known to be syphilitic and there were scars of healed ulcers on both legs. There was a typical spiral fracture of the left tibia and fibula with an open wound and in a few days many large blisters formed. On account of the condition of the skin and the constitutional infection operation was not considered. On February 2, 1921, ice tongs were imbedded in above the malleoli and heavy extension was made with a Thomas splint. After several days extension X-ray showed no relief of shortening. Stimson plaster splints were applied February 13, 1921. Patient left the hospital March 4, 1921, at which time union was not firm. No later report could be obtained.

CASE VIII.—F 881, T. V. Male, aged twenty-one. Admitted February 1, 1921. Classical spiral fracture of tibia and fibula shown by X-ray. Band was applied February 28, 1921—no further splinting. Discharged March 22, 1921, at which time there was firm union without deformity or shortening. No later observation of the patient has been possible.

CASE IX.—F 2435, Female, aged twenty-seven. Admitted March 28, 1921, with classical spiral fracture of tibia and fibula. Band was applied April 7, 1921, with no splint. On April 21st, patient was allowed up and cast was then applied because this patient was feeble minded and could not be trusted. The cast was removed May 20th, and on May 22nd the band was removed. At this time there was firm union and no deformity. Patient was examined in October, 1921, and X-ray taken. Moderate callus is shown. There is no deformity and she gets about without impairment.

CASE X.—F 3737. Male, aged forty-seven. Admitted May 15, 1921, with spiral fractures of tibia and fibula. Band was applied May 24, 1921. Two days later temperature reached 102.4 and the wound was quite inflamed. Drainage was instituted but infection had involved the entire fracture. The band was removed and two months later subperiosteal resection of a three-inch section of the tibia was necessary. At present the wound has healed but there has not been sufficient regeneration of bone to permit weight bearing.

Acknowledgment. The frequently repeated radiograph examinations and attempts at fluoroscopic reduction would not have been possible without the enthusiastic coöperation and help of Dr. Carl Little, director of the X-ray department at the Cincinnati General Hospital.

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VOLVULUS OF THE SIGMOID*

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The purpose of this paper is to present the subject of volvulus of the sigmoid for your consideration and to report five cases of intestinal obstruction caused by this condition. Volvulus of the sigmoid as a form of acute intestinal obstruction is not as rare a condition as formerly supposed. Briggs[1] states this disease is the cause of acute obstruction in fifteen per cent. There is in these cases, strangulation of the bowel as well as the obstruction of the fecal current. The condition of strangulation makes it much more serious for the patient. The sigmoid flexure is the most common site.

One hundred and ten cases of acute intestinal obstruction from various causes have been operated by me. In this number there were five cases due to volvulus of the sigmoid, making for this series a percentage of four and five-tenths. Authors state in about five per cent., volvulus of the sigmoid is the cause of intestinal obstruction. The 110 cases do not include those due to adhesions causing obstruction following shortly after operation. I here report five cases before taking up the subject of the etiology, the mechanism, the diagnosis, the symptoms and the treatment.

Case I.—Mrs. J. A. Age fifty-eight, was admitted to my service at Mercy Hospital, August 13, 1914. She came to the hospital complaining of swelling of feet and ankles which began about two weeks previous to this date. At the same time she was becoming constipated and noticed that her abdomen began to enlarge. She has had chronic constipation for years. Sometimes she would not have an evacuation of the bowels for two weeks and then she would have diarrhœa for several days. She had blood in the stools at times. This was attributed to hemorrhoids. She had a pelvic abscess following her last pregnancy. She has lost twenty pounds in the last seven or eight months.

Operation.—August 21, 1914. An incision was made through the right rectus muscle. There was extreme distention of the colon and the sigmoid. The small bowel was moderately distended. A dermoid cyst of the left ovary was found. It was adherent to the broad ligament, the side of the pelvis and the descending loop of the sigmoid. The sigmoid was twisted on its mesenteric axis and turned down into the pelvis. The foot points of the sigmoid were not disturbed. The dermoid cyst was removed and the volvulus untwisted. She died the second day following operation. Her death was believed to be due to a recurrence of the obstruction.

Case II.—J. G. M. Age forty-four. Male. Occupation carpenter, was admitted to Mercy Hospital at 5.30 P.M. December 11, 1916, being referred to me by Dr. A. D. Price. At 10.00 A.M. on this day while at work the attack began. He was driving a nail above his head, and was bending over backward. I mention

* Read before the Allegheny County Medical Society, December 20, 1921.

[1] Ohio State Medical Journal, 1912.

this fact for the reason that trauma is said to be one of the causes. The attack commenced with colic in the abdomen, left side low down. The colic gradually became worse and very severe, and paroxysmal in character. The distention gradually increased, and at the time of admission to hospital his condition was as follows: The abdomen was greatly distended and was unsymmetrical. Below the level of the umbilicus the abdomen protruded; a furrow was present across the abdomen at the level of the umbilicus and above this the abdomen was pushed out like a balloon, giving the impression of an acute dilatation of the stomach. Pulse 128, temperature 98, general condition good. There was tympany all over the abdomen and no peristalsis was present. The abdominal muscles were not rigid, but were tense. No visible peristaltic waves were observed. He had paroxysms of pain lasting about one minute, at intervals of from five to ten minutes. Two enemata of milk and molasses were given but neither was effective.

Operation.—December 11, 1916. 10.00 P.M. The incision was made through the right rectus for the reason that most of the causes of intra-abdominal intestinal obstruction are found on that side. As soon as the abdomen was opened a great, large, thick, dark bowel presented itself. The incision was then enlarged and an effort made to deliver the bowel. This was found to be impossible. A large aspirating needle, to which was attached a long rubber tube, was inserted into the bowel and a great quantity of gas escaped, after which the delivery of the bowel was made.

Pathology.—The bowel was found to be a distended sigmoid which was twisted on its mesenteric axis, from right to left, two and one-half times. It was dark and gangrenous. Its walls were much thickened and the longitudinal bands greatly broadened.

The diameter of the bowel before aspirating was at least ten inches and after untwisting and being laid on the operating field the apex of the volvulus reached to within six inches of the knee. I estimated that each limb of the volvulus was eighteen inches in length. There was a small amount of fluid in the abdominal cavity, giving off a colon odor. Evidently the colon bacillus had permeated through the bowel wall. The giant sigmoid completely filled the abdominal cavity. All of the remaining parts of the intestines were collapsed and were behind the volvulus. The mesentry of the sigmoid was thickened.

Mechanics of Operation.—The vessels of the mesentery were ligated and the sigmoid resected (angiotribe forceps and cautery method) through the proximal and distal parts of the sigmoid. The ends of the bowel were closed and a lateral anastomosis (clamp method) was performed. Several sutures were then inserted through the ends of the bowel, already closed, to the lateral wall of the descending colon and rectum, respectively, above and below the anastomosis, to hold it more firm. The ligated vessels of the meso-sigmoid lay behind the anastomosis. He made an excellent recovery, having no complications except a slight infection of the lower end of incision, and was discharged from the hospital January 16, 1917.

Previous History of Patient.—In July or August, 1898, he had his first attack of abdominal colic. For this attack he called in Dr. H. O. Huffman of Thomas, West Virginia. At the end of about two weeks Doctor Huffman sent him to the Western Maryland Hospital, Cumberland, Md., where he came under the care of Doctor Miller, who operated upon him for a twist of the bowel.

First Attack after Operation.—Following the operation he was in good condition for two and one-half years (1900) when he had a severe attack of colic with distention. This time he was sent to the Wheeling Hospital, Wheeling, West Virginia, and was under the care of Dr. Gregory Ackerman. Enemata were given there and he was relieved.

Second Attack after Operation.—About one and one-half years later (1902),

he had another attack of colic with distention. This time he relieved himself by the use of enemata and the rectal tube. A year or two later, 1903 or 1904, he had another severe attack and was sent to the Cottage Hospital, Connellsville, Pa. He was there relieved again by enematas. He states that he would be free for a couple of years and then again have a recurrence of his attacks. He thinks that in the last eight or ten years he would have an attack once a year, on an average, but during the last year he had three or four attacks, the most severe one occurring in July, 1916.

Except for the times he entered a hospital for treatment he has always been able to relieve himself by enemata and the rectal tube. In every attack he always had colic with distention. The pain was always the same; the distention would vary. The pain was always first noticed on the left side of the abdomen, low down, and would extend up toward the umbilicus.

The attacks came on always during the day while at work. He does not remember of ever having an attack which began in the night. He believes that he has had altogether twenty attacks. This history is given purely from the memory of my patient. It is interesting for the reason that he, no doubt, has had a chronic volvulus at intervals for years.

He has evidently had a greatly enlarged and thickened sigmoid for years. This enlargement and thickening of the sigmoid made him an excellent subject for recurring or chronic volvulus. The exciting cause, I believe, in this attack, was trauma. His attacks always occurred when he was working. It is my opinion that enough trauma or force can be applied by means of the abdominal muscles to start the twisting of the sigmoid.

This case corresponds closely to one reported by Dr. Joseph C. Bloodgood,[3] His patient had thirty-two distinct attacks of chronic volvulus.

Case III.—A. M. Age sixty-six, was admitted to the Presbyterian Hospital February 12, 1918, to the service of Dr. C. W. Morton.

History.—He states that he had been constipated for thirty years. In 1906 or 1907 he had difficulty for the first time in obtaining an evacuation of his bowels and was compelled to resort to enemata and the rectal tube. Since this time he has used enemata and the rectal tube about twenty times every year. The symptoms during these attacks were colic, distention, borborygmus and pain in the small of the back with obstipation. At the time of admission to the hospital, his bowels had not moved for five days. One week before this attack he had experienced much difficulty in obtaining a bowel movement. His symptoms on coming into the hospital were as follows:

Great distention of the abdomen and a large mass was present in the right lower abdomen. He was in good general condition with practically no change in his pulse or temperature. Enematas and some medication were given and eventually good bowel movements were obtained. As soon as this occurred the distention went down and the mass noted before on the right, would be found on the left side of the abdomen. The mass would never entirely disappear although it would leave the right side of the abdomen going to the left.

During the period in the hospital before operation the distention would recur and the mass would extend again to the right side of the abdomen. The diagnosis of volvulus of the sigmoid was made. I saw him the first time with Doctor Morton about the 15th of February. There was a mass, (Von Wahl's sign) present in the left side of the abdomen but as his bowels were open, we decided to wait a few days before operating to allow him to recuperate a little and also to fill him up on fluids. The distention again recurred and after decreasing the distention by enemata, operation was performed.

[3] Annals of Surgery, 1909.

While he was going under the anæsthetic marked visible peristalsis on the left side of the abdomen was observed.

Operation.—February 22, 1918. A seven-inch incision was made through left rectus. The sigmoid was enlarged and the walls were thickened and congested. It was thirty inches in length and its largest diameter was about eight inches. It was twisted on itself from right to left. The beginning of the sigmoid was narrowed while the part going into the rectum was much increased in diameter. There were some adhesions on the outer surface of the mesentery of the sigmoid where the descending colon and the sigmoid meet.

The mesentery of the sigmoid was thickened and the blood-vessels were enlarged. The remaining parts of the intestines were not distended.

Mechanics of Operation.—To perform simply a detorsion would not have benefited this man at all and I decided to resect the sigmoid and perform a lateral anastomosis between the proximal and the distal parts of the sigmoid flexure, respectively remaining.

The sigmoid was partially resected (angiotribe forceps and cautery method) and the vessels in the mesentery controlled.

The ends of the divided gut were closed. I attempted to do a lateral anastomosis by the clamp method. I found I had not left enough gut to do this and was forced to employ a Murphy button. I regretted the error in not having enough gut to perform the lateral anastomosis by the clamp method. My error is, I think, easily explained. Before the gut and the mesentery were divided the whole sigmoid could be lifted outside the abdomen. As soon as the resection was completed, the mesentery pulled the intestine inside the abdominal cavity and the intended type of anastomosis could not be done.

Convalescence.—His condition was satisfactory for four days. During this time his bowels moved satisfactorily. On the fourth day he developed obstruction of the bowels, caused, I believe, by too much tension at the site of anastomosis.

It was necessary to make an artificial anus by opening the end of the descending colon or the beginning of the sigmoid through a McBurney incision. He also developed a fecal fistula through the abdominal incision. This has never quite closed and gives him some annoyance at times. His bowels move well through artificial anus. It is remarkable how well he can regulate them. He is today able to follow his occupation, that of a tailor.

While this paper was undergoing preparation this man came to see me. He found that more of his intestinal contents were coming through the abdominal incision than through the artificial anus. The cause of this was due to the gradual closing of the artificial anus. On December 12, 1921, he was given chloroform and the opening of the gut at the site of the artificial anus enlarged with the fingers. I anticipate that this will again make him comfortable. I have noticed in other cases that where I had made an artificial anus through a McBurney incision there was a tendency for the opening to close. The Murphy button fell the wrong way and has never been recovered.

Case IV.—H. L. B. Male. Age twenty-three, was admitted to my service at Mercy Hospital August 17, 1919, being referred to me by Dr. G. W. Gallagher, of Connellsville, Pa.

History.—He is a rugged young adult and his occupation is that of car inspector. He has always had good health but has been chronically constipated most of his life. He states that when he becomes constipated it is accompanied by general abdominal colic and much gas. By taking a purgative he is relieved of his discomfort. These attacks (colic and gas) usually occurred once a month but sometimes he would not have them for five months. In 1915 he had a severe

attack of abdominal colic lasting one night. His appendix was removed in March, 1917, after which he had no attacks for one year, when they again recurred.

On August 14, 1919, he had an attack which began with severe pain just below the umbilicus. The pain worked its way up to the pit of the stomach and upper left quadrant of abdomen. In all his attacks he had marked pain in the back.

At the time of admission to the hospital his abdomen was markedly distended and his abdominal muscles were tense but not especially rigid. His peristalsis was not lost entirely but was faint. His temperature was about 102° and his pulse was slightly accelerated. Enemata were given but no results were obtained.

Operation.—August 18, 1919. A twelve-inch incision was made through scar in midline of former abdominal section. The sigmoid was found twisted on its mesenteric axis one and one-half times from right to left. It was large, being about fifteen inches long from its foot points to its apex. It was eight inches in diameter at its largest part. It filled the left half of the abdomen. In the descending part of the sigmoid where the twist of the gut occurred the wall was destroyed around its entire circumference. This was close to the beginning of the rectum. Not much remained but the serosa. There were adhesions between the ascending loop of the sigmoid and the parietal peritoneum. There was some fluid in the abdomen. The remaining parts of the intestines were not especially distended.

Mechanics of Operation.—Detorsion was performed and a partial resection of sigmoid done (angiotribe forceps and cautery method) and a lateral anastomosis was made by the means of a Murphy button. In this case it was necessary to go beyond the damaged gut caused by the twist and only enough was left to connect with a Murphy button.

Convalescence.—On September 3rd, eighteen days after operation, some fecal matter and gas came through lower end of incision. At the time of discharge from hospital, September 29th, there was occasional fecal discharge from incision. This condition eventually cleared up and at the present time he is well in every way and is able to follow his usual line of work.

CASE V.—E. K. Male. Age fifty-two, was admitted to my service at Mercy Hospital, November 29, 1921, being referred by Dr. E. W. Weller.

History.—For the past year he has had constipation of gradually increasing severity. He noticed that flatulence accompanied by cramp-like pain occurred more frequently and that larger doses of medicine were required to obtain free evacuation. On arising at 7.30, the morning of November 27th, he had severe cramp-like pains over entire abdomen. He took his usual remedy, cascara, and other medication without effect. The cramp-like pains were more severe than any he had ever experienced and were all over the abdomen. Later the pains disappeared from the right side of the abdomen, but remained in the left. He noticed borborygmus for the first twenty-four to thirty-six hours. He vomited the first time at midnight on Monday, November 28th. Since that time vomiting has occurred more or less frequently.

The pain from the beginning was more severe on the left side.

At the time of admission to hospital his condition was as follows:

General condition good. Temperature and pulse about normal. Leucocyte count 18,000. Blood-pressure 150-90.

The abdomen was distended; tense but not rigid. There was some tenderness over abdomen. The peristalsis was almost absent. There was a localized soreness on the left side of the abdomen just below the umbilicus.

A volvulus of the sigmoid was anticipated, for the reason that the most of his local symptoms had been on the left side as well as a localized tenderness on the same side.

Operation.—November 29, 1921, 3.25 P.M. An eight-inch incision was made

through the left rectus muscle. The sigmoid flexure was found twisted from right to left on its mesenteric axis 180 degrees. It was large, being about sixteen inches long from the foot points to its apex, and at least six inches in diameter at the largest part. The walls of the gut were thickened and congested. The mesentery was also thickened and there were marked adhesions, 3 to 4 inches broad, on its outer surface, midway between the foot points and the apex of the sigmoid. These adhesions were confined to the mesentery (contracting mesenteritis) and drew the sigmoid together. The gut extended up to the liver and practically filled the entire abdominal cavity. The distal part was larger than the proximal part. The foot points were not drawn together.

The remaining parts of the intestines were not distended.

Mechanics of Operation.—The sigmoid was untwisted, and, after a rectal tube was inserted through the anus to allow gas and fecal matter to escape, a partial resection, (angiotribe forceps and cautery method) was done. The resection was made about six inches from the foot points of the sigmoid. This left enough gut to do a lateral anastomosis as well as leaving a part of the sigmoid to again act as a reservoir.

Convalescence.—His recovery was uneventful. He had no complications. Bowel movements for several days before leaving the hospital were normal. He was discharged from the hospital December 15, 1921.

Etiology.—The production of a volvulus of the sigmoid is the result of several causes. The primary cause is, I believe, due to an enlarged sigmoid and which is probably congenital. The next factor of most importance is constipation. Adhesions following attacks of inflammations, operations, and the presence of tumor plus inflammation will play a part.

Bloodgood [2] mentions adhesions running from the outer surface of the sigmoid and the meso-sigmoid to the floor of the left iliac fossa as a cause. It seems reasonable to me that these adhesions found connected with the sigmoid and its mesentery are the direct result of constipation. Any bowel which is filled with fecal matter (constipated) over a long period will have increase of the thickness of its walls. The thickening can hardly be the result of peristaltic action. The mesentery is contracted as a rule in these cases, and is called contracting mesenteritis. It is, I believe, produced by no other cause than constipation. This contraction of the mesentery draws the foot points and the proximal and distal parts of the sigmoid together and makes it more easy for it to become twisted. Trauma is reported to be a cause.

Predisposing Causes Also are Found.—It usually occurs after forty years. The ages of my patients were as follows: Twenty-three, forty-four, fifty-two, fifty-eight and sixty-six years. It is more common in males—four to one, in my series. A congenital enlargement of the sigmoid is naturally a factor, and is probably always present.

Mechanism of Volvulus of the Sigmoid.—Bloodgood,[2] in his article, gives a very sensible idea of the mechanism, and I will give you his construction of it. He believes that the dilatation of the sigmoid is present before the first attack. Fermentation with the formation of gas in this large sigmoid he considers to be the first etiological factor. This distended loop of bowel is lifted up into the abdominal cavity. As it rises it produces a kink at its

junction with the descending colon for the reason that this part of the bowel is fixed. This kinking produces obstruction at this point. At this time he states there is no kink in the rectum. Later on, as the dilated sigmoid arises, its upper arm becomes more tense on account of its attachment to the fixed descending colon. The lower portion of the sigmoid and the upper rectum which are less fixed, rise, and as the least resistance is up and to the left, the distended lower portion of the sigmoid and the rectum move in that direction, and the upper portion of the sigmoid is twisted downwards and to the right, while the lower portion moves upwards and to the left, and the twist is from right to left. The twist kinks the rectum and we have a double obstruction.

Diagnosis and Symptoms.—The diagnosis is difficult, but given a case in which there is history of constipation and in which the pain commences on the left side, low down, extending upward as the gut increases in size, with vomiting coming on late, with little or no peristalsis and with obstipation, volvulus of the sigmoid should be considered.

In three of my cases there was but little peristalsis. In these three the sigmoid filled practically the entire abdominal cavity. The remaining parts of the intestines were behind it and consequently peristalsis could not be heard or was very faint.

In Cases II, III, IV and V the pain began on the left side, low down, and extended upward. There was also a feeling of fullness in this region. Marked visible peristalsis entirely on the left side was present in number three. Local tenderness is usually present on left side. There was pain in the back in Cases III and IV. Vomiting comes on late in all forms of intestinal obstruction, occurring low down in the intestinal tract.

The twist in all cases, except No. I, was from right to left. Von Wahl's sign (a tense, smooth tumor in iliac fossa) was present in No. III.

Treatment.—No purgatives are to be given. The treatment is surgical, however; enemata should be first tried. To obtain results they should be given in the knee-chest position. Cases II and III found out for themselves that this position was the best way to obtain relief.

If no result is obtained after one or two enemata surgical interference should be done at once.

The incision is to be made on the left side and volvulus untwisted. It is my opinion that a resection should be done in all cases and not return the bowel to the abdominal cavity, as is the usual custom. In some cases on account of extensive gangrene and poor condition of the patient, it may be necessary to establish an artificial anus or to bring the bowel outside the abdomen and allow it to slough off. To return the bowel to the abdomen after untwisting does not seem to me to be a good surgical procedure. Why return a bowel such as this when it can easily be resected and an anastomosis performed? Adhesions as noted in the etiology may be found. They may be divided. It is a well-known fact that adhesions are most likely to reform and many

times are more strong and dense than the original ones. If tney have much to do with the cause of a volvulus of the sigmoid they will again aid the twisting. Nothing can be done with the contracting mesenteritis to avoid recurrence. This contraction causes the proximal and distal tubes of the sigmoid to be drawn together as well as the foot points and renders the twisting more easy. The constipation is not changed by simply untwisting the sigmoid. Even in cases in which the bowel is not viable, and in which there is fluid in the abdominal cavity of colonic odor, resection can be done with safety. In Case II the gut was not viable and fluid in the abdominal cavity gave off colonic odor. It is not necessary to remove the entire sigmoid. It is best to leave about six inches of the proximal and distal parts of these giant sigmoids. A lateral anastomosis can then easily be done. This technic will leave a certain part of the sigmoid to again act as a reservoir.

My belief is that these cases which have recurring volvulus of the sigmoid have had a colon infection of the peritoneum so often that they have formed an autogenous vaccine which enables them to overcome the inflammation. I can see no reason why the risk should not be taken and cure the patient of the volvulus and at the same time of his constipation.

VALUE OF BLOOD-PRESSURE IN ACUTE CEREBRAL COMPRESSION

AN EXPERIMENTAL AND CLINICAL STUDY

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FROM THE NEURO-SURGICAL SERVICE OF BARNES HOSPITAL

During the course of a number of experiments with general increased intracranial pressure,[1] it was noted that there seldom occurred the compensation on the part of the medullary centres which has been described by Spencer and Horsley,[2] Cushing,[3] Naunyn and Schrieber,[4] Eyster, Burrows and Essich [5] and others.

A number of workers have noted that the rise of blood-pressure following section of both vagi was greater than before their section when the animal was subjected to increased intracranial pressure. It was also noted by Loevenhart, Malone, and Martin [1] that paralyzing the motor endings of the vagi with atropine under general increased intracranial pressure, in two experiments, caused the vasomotor centre to fail rapidly.

With these facts in mind the present research was undertaken in an effort to ascertain what factors, other than reduced oxygen supply, govern the compensatory rise of blood-pressure following general increased intracranial pressure.

Methods.—Experiments (thirty) were performed on dogs and rabbits under ether anæsthesia. The intracranial pressure was applied to the subdural space by means of a tight-fitting cannula inserted in the skull in the parietal region and the cannula then connected to a pressure bottle which was filled with Ringer's solution. This system was connected to a U-shaped manometer for recording the pressure.

The blood-pressure was recorded by means of the ordinary U-shaped mercury manometer connected to the carotid artery and a pressure bottle. The respiration was recorded by means of a rubber bag bound to the body and connected to a recording tambour. The time was recorded in seconds. When artificial respiration was given it was given with an automatic artificial respiration tank connected to an ether bottle and then to a tracheal tube.

In dogs the response of the medullary centres to general increased intracranial pressure was studied under varying degrees of depth of anæsthesia, with one vagus cut, with both vagi cut or cocainized, and with motor vagal endings paralyzed by atropine.

In rabbits the same response was studied under varying degrees of anæsthesia, when the depressor nerves were cut, when both vagi were cut and when both the vagi and depressors were cut.

RESULTS

Experimental. 1. *Variations in depth of anæsthesia:* a. Light third stage ether anæsthesia:—In both rabbits and dogs under this condition there resulted the classical response of the medullary centres to increased intracranial pressure, namely: a rise of blood-pressure, stimulation of the respiration followed by normal rhythm or Cheyne-Stokes breathing, depending upon whether the blood-pressure increase remained constant or periodic as it is so often seen, temporary stimulation of the vagal centre with resultant vagal pulse. The amount of compensatory rise of blood-pressure before the vasomotor centre was fatigued varied in different animals but it was never less than 40 mm. of Hg. The length of time the compensation would last also varied in different animals and in the same animal depending largely upon the degree of increased intracranial pressure to which the animal, was subjected. In no case did the compensation hold longer than an hour unless artificial respiration was instituted when the respiration began to fail. In many of these experiments the response of the medullary centres was absent under deep anæsthesia but returned again under light anæsthesia.

b. Deep third stage anæsthesia (corneal reflex and reaction of pupil to light absent or sluggish). Under these conditions the compensation of the medullary centres to increase intracranial pressure was either entirely absent or very slight and when present lasted only a few seconds. Rapid decompression and artificial respiration was necessary to save the animal. In many of these experiments good compensation occurred whenever the anæsthesia was lightened even though the compensation had been absent under deep anæsthesia.

2. *Effect of Cutting Vagi.*—In some experiments the intracranial pressure was raised until a maximum medullary compensation occurred and allowed to remain at this level for about 5 minutes. One and then both vagi were cut. It was found that the cutting of one vagus rarely changed the degree of compensation but when both vagi were cut the blood-pressure and the lung ventilation increased so that the relative anæmia of the brain was decreased and the animal was able to live much longer than would have been possible had the increased compensation not occurred.

3. *Effect of Paralyzing the Motor Endings of the Vagi with Atropine Sulphate.*—Doses of atropine large enough to paralyze the vagal endings failed to stimulate the respiration and caused a slight transitory rise of blood-pressure, due to removal of the vagal tone, followed by a rather rapidly falling blood-pressure and death. In one experiment both vagi were cut as soon as the blood-pressure began to fall and an increase in blood-pressure, which persisted for some time, followed. Thus it is evident that the loss of vagal tone is deleterious to medullary compensation following increased intracranial pressure, and also that the benefit derived from section of the vagi is not dependent upon the motor fibres.

4. *Effect of Cutting the Depressor Nerves.*—These experiments were carried out in rabbits where the depressor fibres of the vagus are in a separate bundle. It was found that the blood-pressure increased to a higher level after section of the depressor nerves than before and that on section of the vagi no further increase occurred. In experiment 14 the blood-pressure increased from 140 to 190 mm. of Hg before the depressors were cut and from 70 to 170 after the depressors were cut. In experiment 22 the rise of blood-pressure was 35 mm. of Hg more after section of the depressor nerves than before their section. Section of both vagi with depressor nerves intact gave no increase in medullary compensation.

SUMMARY

1. Under light third-stage ether anæsthesia medullary compensation occurs consistently following an increase in the intracranial pressure. This did not occur when the anæsthesia was deep.

2. The medullary compensation to increased intracranial pressure is greater following section of both vagi in the dog or both depressor nerves in the rabbit than with these nerves intact. This was not true when only the vagi were cut in rabbits or when the motor endings of the vagi were paralyzed with atropine. Therefore the cutting of the afferent fibres in the vagi is the important factor in producing the better compensation following section of the vagi.

Clinical.—The depth of ether anæsthesia determines the response of various reflexes, and in the experimental work it was noted that when the anæsthesia was light enough to allow medullary compensation, the corneal reflex and the reaction of the pupil to light was very active. It seemed possible that the loss of pupillary and corneal reflexes under deep anæsthesia was comparable to the loss of these reflexes following intracranial injuries, and therefore there might be some relation between the condition of the reflexes and the ability of the medullary centres to compensate for increased intracranial pressure. The reaction of the pupil to light was selected as a reflex phenomenon to serve as a criterion of the condition within the skull. The corneal reflex should also be valuable, but it was not observed often in the cases studied below.

With this in mind a study was made of records of the cases of cerebral injury seen in Barnes Hospital for the past ten years. There were seventy-eight cases, of which thirty-five had subtemporal decompressions; no fracture could be demonstrated with the X-ray in some of these cases. For the past ten years it has been routine on Doctor Sachs' service to take blood-pressure readings every fifteen minutes in all cases of suspected acute cerebral injury. Some cases, however, had such incomplete records that they could not be used for this study. Therefore thirty cases of the thirty-five cases of decompression were used. The balance of the forty-four cases summarized in Table I are those in which blood-pressure records showed a definite increase in blood-pressure, eye reflexes active, but no subtemporal decompression was done.

TABLE I.

No. of cases	Reaction of pupils to light	Size of pupils	Blood-pressure compensation	No. died	Per cent. died
22	Active	Not dilated	Active for hours	3	13.54
9	Sluggish	Dilated	Fair for few hours	4	44.4
13	Absent	Widely dilated	Little or none	8	61.5

In Table I the results are grouped and are seen to fall in three classes:

1. When the reaction of the pupils to light was active there was a good blood-pressure compensation which lasted many hours, and on decompression

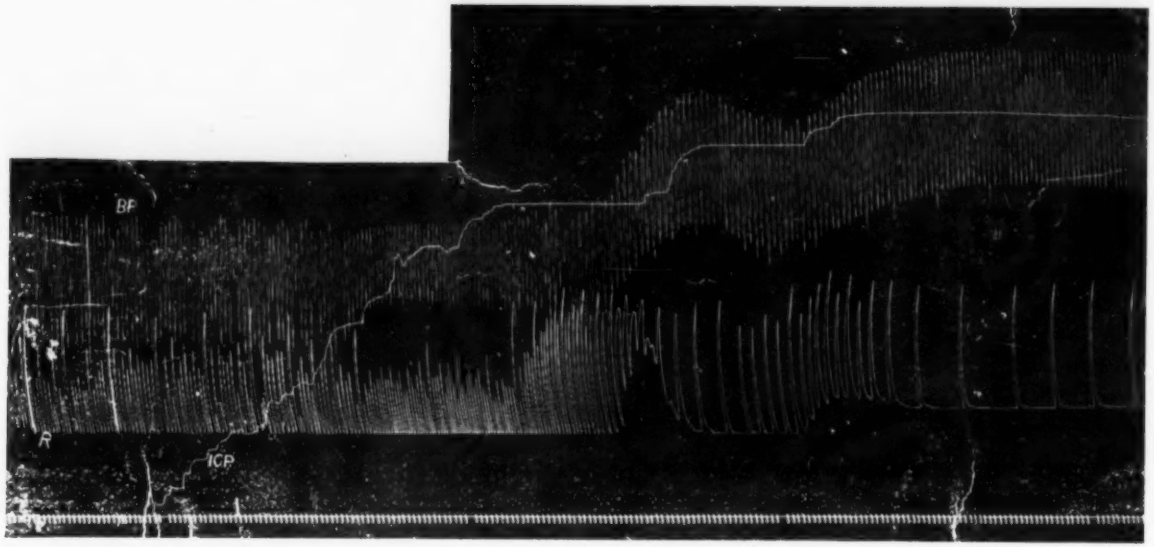

FIG. 1.—Shows a typical medullary compensation to increased intracranial pressure under light anæsthesia. BP, blood-pressure. R, respiration. ICP, intracranial pressure. T, time in seconds.

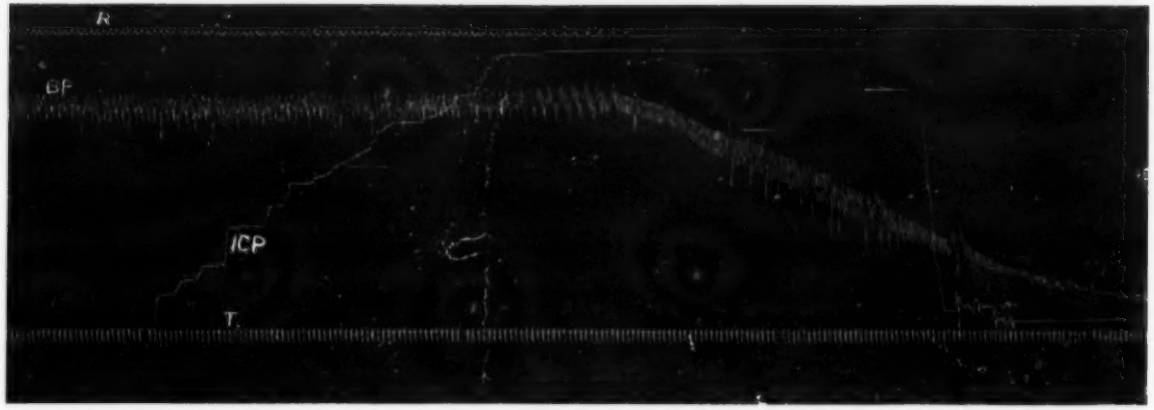

FIG. 2.—Showing lack of compensation on the part of the medullary centers to increased intracranial pressure under deep anæsthesia. R, respiration. BP, blood-pressure. ICP, intracranial pressure. T, time in seconds. (Respiratory excursion poor because of leak in tambour.)

the blood-pressure returned to normal and the patient usually recovered satisfactorily.

2. When the pupils reacted poorly to light and were dilated the blood-pressure compensation usually was not as great, was of shorter duration, and even on decompression a much larger percentage of cases was fatal.

3. When the pupils were dilated and did not react to light, there was either no blood-pressure compensation or only very slight compensation of short duration and the mortality was very high.

From this it is evident that the blood-pressure is a good criterion of the severity of the cerebral compression when the reaction of the pupil to light is active or even sluggish and the pupil is not widely dilated. If, on the other hand, the pupil is widely dilated and does not react to light, the blood-pressure is of no service as an index as to the degree of cerebral compression. Also, when the reaction of the pupil to light is sluggish or absent, the prognosis is grave and no time should be lost in relieving the intracranial pressure.

CONCLUSIONS

1. Medullary compensation following increased intracranial pressure is a constant phenomenon experimentally when the anæsthesia is not deep enough to block the corneal reflex or the reaction of the pupil to light, but is absent when the anæsthesia is deep.

2. The depressor fibres in the vagus inhibit the rise of blood-pressure following increased intracranial pressure.

3. Clinically, blood-pressure compensation following increased intracranial pressure is a valuable criterion of the degree of cerebral compression when the pupils react to light, but is of no service when they do not.

4. A sluggish or absent reaction of the pupils to light indicates a grave prognosis and no time should be lost in relieving the cerebral compression.

It has been an almost invariable rule, however, on the Neuro-surgical Service not to decompress a patient if the blood-pressure is falling or is below normal. This has been taken as evidence that the last stage of compression has been reached and that the medullary centres are exhausted and can no longer compensate.

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TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting Held January 9, 1922

The President, Dr. George G. Ross, in the Chair

DISARTICULATION OF THE HIP

Dr. James K. Young presented a patient, age sixteen, male, who without history of trauma, noted pain in left knee and thigh, December 15, 1920.

On examination by the speaker January 3, 1921, there was swelling of left leg, beginning just above the condyle, reaching its maximum at three inches above and tapering off above that to a distance of four or five inches. Tender, limitation of flexion, knee-pain on motion. No involvement of joint. No pulsation. Wassermann was negative to all antigens. Urine negative for Bence-Jones bodies; decided amount indican, no albumin, sugar or casts. The blood count showed: Red cells, 5,300,000; white cells, 14,700; hæmoglobin, eighty-seven per cent.

Physical examination of chest, few subcrepitant râles both apices. First X-ray January 10, 1921. Periosteal sarcoma starting about middle of femur, involving soft parts and invading shaft just above internal condyle. X-ray chest April 7, 1921, showed tuberculous right apex but no metastases.

Was treated by X-ray January 11, 1921. This was continued until a few days before operation.

Operation March 21, 1921. Complete disarticulation at hip by Wyeth method.

Microscopic examination showed spindle-cell sarcoma, arranged in nests, but large amount of necrotic material and some cells resembling giant cells. Shows extensive necrosis. There are a number of multinucleated cells of bizarre character. Highly malignant.

BONE TRANSPLANTATION USED FOR TIBIAL CYST

Dr. James K. Young also presented a female, age eighteen, who at six years of age was kicked in the left ankle. About two months later the lower end of the tibia began to swell. She received no surgical treatment until about three years ago when she was operated upon and the lower end of the tibia was scraped. Following this operation, she was temporarily relieved, but several months later the cyst returned.

The patient came under his observation about two years ago and an X-ray examination revealed a benign cyst of the lower end of the tibia. She was operated upon at the Polyclinic Hospital May 19, 1920. At the operation the following condition was found. The cortex was thinned out, resembling an egg shell. The cystic content was a thick yellowish fluid. The wall of the cyst was lined with a thick capsule;

its shape globular, the bony walls of the tibia being equally distended in all directions.

The operation consisted in crushing the lower end of the tibia after a thorough curettage and implanting into the cyst cavity a bone graft from the opposite tibia. There was no post-operative hemorrhage and the patient has suffered no pain since operation.

On May 5, 1921, the tendo Achillis was divided for talipes equinus, since which time the foot has been perfect.

FOREIGN BODY IN THE ABDOMEN

Dr. C. F. Mitchell reported a case, number 4382–1921, who was admitted to the Pennsylvania Hospital on October 8, 1921, complaining of a painful swelling in the left groin.

Some three weeks previous to his admission, while running for shelter, he suddenly experienced a sharp and severe pain in the left lower abdomen. This pain persisted for several following days, but apparently it was not sufficiently severe to make him give up his work as a day laborer. A week later, however, he noticed that a small, hard lump was forming in the lower left abdominal quadrant close to the left groin. He complained that this lump was becoming increasingly painful at the time of his admission. He complained of no other symptoms and there was nothing in his history which pointed to involvement of either the gastro-intestinal or genito-urinary systems.

Examination disclosed in the left lower abdomen, just above Poupart's ligament, a small oval mass, roughly three cm. in diameter. There was no change in the texture of the overlying skin; the surface of the mass was very slightly irregular and firm in consistency, apparently adherent to the anterior abdominal wall and did not seem to be connected with the underlying structures. It proved to be only slightly tender to manual examination.

The provisional diagnosis of a tumor of the anterior abdominal wall was made.

Five days later an incision about seven cm. in length was made just above, and parallel to, Poupart's ligament. It was then found that the mass was not in the abdominal wall, but evidently intraperitoneal. The peritoneum was opened inferior to this mass, which was found to be adherent above to the peritoneum and laterally to the sigmoid. It was firmly bound up in a mass of omentum, and in all proved to be about the size of a small lemon. Little difficulty was experienced in freeing this mass and delivering it from the abdominal cavity. Apart from rather dense adhesions, there was no further involvement of the surrounding gut and no evidence of a perforation.

The mass which was apparently composed largely of omental tissue was incised. It proved to have a rather firm wall of irregular scar tissue, central to which there was a small cavity with a very uneven necrotic edge, the whole structure being very evidently the result of a chronic inflammatory process. In this central cavity a small piece of wood was embedded. It was about the size of a large toothpick, with one sharp-pointed end, and measured approximately three cm. in length.

The patient made a fairly uneventful recovery from the operation, although an infection of the abdominal incision took place which delayed healing.

On subsequent questioning of the patient he was unable to recall the ingestion of the small splinter of wood.

He was discharged from the hospital three weeks after operation in good condition.

MULTIPLE FIBROMATA OF THE ILEUM CAUSING RECURRENT DOUBLE INTUSSUSCEPTION

Dr. Walter Estell Lee reported the case of a female, forty years of age, admitted to the West Service of the Pennsylvania Hospital August 15, 1921, with the hospital number 3223. At the time of admission she complained of recurring attacks of pain in the lower abdomen which were accompanied by vomiting. These attacks were usually associated with tenderness in the right iliac fossa. She had come to the hospital June 25, 1921 (No. 2231) complaining of similar symptoms and at that time a provisional diagnosis was made of chronic appendicitis. The symptoms continuing, it was decided to remove her appendix at the second admission, and it was found to be practically normal by the pathologist.

She obtained no relief after the appendectomy and was admitted to the hospital for the third time September 3, 1921 (No. 3664), with symptoms of acute intestinal obstruction. The abdomen at this time was not distended, there was moderate tenderness and no rigidity and distinctly visible peristalsis and loud peristaltic sounds were heard on oscultation. No abnormal masses could be detected by abdominal or vaginal examination. There was a healed scar over the right lower rectus muscle, evidently made at the previous operation. The patient was operated on at 3 A.M. under ether anæsthesia. The abdomen was opened by excising the old scar. Distended ileum slightly darker in color than normal and containing considerable fluid immediately presented. The collapsed transverse colon was next found and followed to the ileocæcal valve and then the collapsed ileum was followed for about three feet when a large mass was encountered. Upon delivering this mass of intestines, which was about eight inches in length, it was found to be an intussusception of the ileum. The intussusception was readily reduced by milking the distal portion from the proximal mass. Two intussusceptions were found; in other words, the intussusception was a double one. Thus the intussuscipiens of the first intussusception was the inner layer of the second intussusceptum. By this arrangement the layers of gut from within out were (1) the entering tube; (2) the returning layer of bowel (1 and 2 constituting the first intussusceptum); (3) the first intussuscipiens, which was also the inner layer of the second intussusceptum; (4) the returning layer of the second intussusceptum; (5) the second intussuscipiens. Covering the inner layer of the first intussusceptum were white patches which were apparently fibrinous exudates. These were very carefully palpated and did not seem to involve any tissue except the peritoneum. The bowel was

FIG. 1.—Multiple fibromata of the ileum.

in good condition and the normal color of the involved ileum rapidly returned after the application of hot saline. The amount of ileum involved in this process was about twenty-four inches. The intestines were returned to the abdominal cavity and the abdomen closed by separate layers with iodized catgut. No drainage was used. The patient was discharged twenty-one days later after an uneventful convalescence.

September 27, 1921, three days after she was discharged from the hospital, the patient returned for the fourth admission with definite symptoms of intestinal obstruction (No. 4154). Under nitrous oxide anæsthesia the old scar was excised and the abdominal cavity opened. The abdomen was practically free of adhesions and distended bowel presented as at the time of the previous operation. Upon exploring the right iliac fossa a mass of ileum was found and delivered, which proved to be another intussusception, and involved exactly the same portion of bowel as at the previous operation. It was about the same length, eight inches, and was double as before. It was easily reduced by milking the distal portion from the proximal mass, when several small white areas were seen shining through the peritoneal surface of the involved bowel. Upon palpation masses were distinctly felt corresponding to these discolored areas which apparently were new tissue involving the entire wall of the bowel. About twenty-four inches of bowel was resected and the severed ends reunited by an end-to-end anastomosis. Iodized catgut only was used. The bowel was returned to the abdomen which was closed by layer sutures of iodized catgut in the abdominal wall. The patient was discharged at the end of twenty-one days after an uneventful recovery.

Upon opening the specimen of intestine by longitudinal incision in its centre is found an area 5.5 x 3.5 cm. just visible on the serous side from which two globular masses project into the lumen, 3 and 2.5 cm. in diameter, respectively. The mucous surface of the masses was deep red. They are firm and a translucent white on cut surface. Contiguous to them are two similar elevations rising out 4 cm. above the level of the normal mucosa. At other places in the intestine are masses of similar consistency over which the mucosa is normal in appearance and freely movable. They vary from 1.0 to 2.0 cm. in greatest diameter and one of them projects into the lumen as a finger-like process 3 cm. long and 1.5 cm. in diameter.

Microscopical Examination: The tumor is a moderately cellular fibroblastic tissue with some well-matured cells, but many which are imperfectly differentiated. Many of the nuclei have dark, irregular structures which could probably be interpreted as typical karyokinetic figures. The blood supply is small and consists of capillary whose walls are composed of a single layer of endothelial cells.

Diagnosis: Malignant fibro-blastoma.

Doctor Allen reported that he had had a similar case at the Bryn Mawr Hospital. The patient was a boy, about ten years of age, with intestinal obstruction caused by intussusception in the small bowel. The intussusception was reduced and the bowel opened. There were a number of masses, some-

what like those described by Doctor Lee, growing from the bowel wall. The larger ones were excised and the bowel closed. Several months later, the boy had another intussusception with obstruction. This time several inches of small intestine were resected. The specimen showed a larger number of polypoid masses, of varying sizes, than at the first operation. The patient recovered.

THYROID TOXÆMIA

DR. HUBLEY R. OWEN recited cases, illustrating the condition of thyroid toxæmia occurring in policemen and firemen under his care. They were shown for the purpose of demonstrating the prevalence of this condition among the members of the Police and Fire Departments. The speaker stating that he had under his care cases of thyroid toxæmia in the proportion of one to every 650 men, which seemed to him to be a high percentage. The constant excitement of their occupations may be a possible etiological factor of the condition.

CASE I.—Hoseman "B," age forty-two. In 1920 had rheumatism. Also had pyorrhœa. Present condition began in March, 1921. First symptom was palpitation, followed by nervousness. In June, 1921, had badly diseased tonsils removed. Since his tonsillectomy has gained thirty-six pounds in weight and is much improved. Is being treated at the Jefferson Hospital by application of X-rays. Is now able to do active duty in the office of the Fire Marshal. The patient dated the onset of his symptoms to long and severe duty at a fire. Basal metabolism at present time, plus twenty.

CASE II.—Patrolman "S," age thirty-three. The first symptom was swelling of the thyroid gland. He noticed this in October, 1920. This was followed by marked palpitation, and then by tremors. He was admitted to the Police and Fire Ward, Philadelphia Hospital, and had tonsils removed. Since his tonsillectomy has gained ten pounds in weight, and is now doing active police duty. Basal metabolism at present time, plus two.

CASE III.—Patrolman "A," age thirty-nine. In Police Department for five years. In February, 1920, had diabetes. Loss of weight from 162 to 119 pounds. In June, 1920, first symptoms noted were nervousness and tremors, followed by enlargement of the thyroid gland. Has had no palpitation. His Wassermann was plus four. Was given specific treatment. Present weight 163 pounds. Has slight exophthalmus. No tremors at present time, and no palpitation. Is doing active duty in the Police Department.

CASE IV.—Patrolman "L," age forty-three. Served eleven years in Police Department. Had frequent attacks of tonsillitis and rheumatism. First symptoms of thyroid toxæmia started in 1919. First symptom noticed was nervousness, followed by palpitation, and enlargement right lobe of thyroid gland. He states that his nervousness began immediately following a fight which he had while making an arrest during a trolley strike. Had a complete thyroidectomy. At present time has marked exophthalmus. Palpitation and nervousness both im-

proved. He is doing active police duty. The highest basal metabolism was in this case, plus ninety.

CASE V.—Patrolman "W," age thirty-nine. Had influenza in 1919. Shortly after his attack of influenza noticed that he was losing weight. Had constant nausea, and this was followed by nervousness and palpitation, and lastly by exophthalmus. Has been treated by absolute rest, and monthly application of X-rays. Has gained eighteen pounds in weight. Still has some tremors and some palpitation. Is doing light duty. Present basal metabolism is plus twenty.

FOREIGN BODY IN RECTUM

DR. JAMES H. BALDWIN recorded a case reported to him by Dr. Horace Phillips, physician to the Eastern Penitentiary. The patient stated that he had introduced a piece of wood into the rectum to produce an evacuation of the bowels and that it had slipped from his grasp and he was unable to remove it. Digital examination showed a foreign body as high in the rectum as could be reached by the tip of the examining finger. Under ether anæsthesia the sphincter was dilated and a piece of wood, eight and three-fourths inches long, was grasped by forceps and easily withdrawn. The patient suffered no ill effects. He was about thirty-five years of age, never had any visitors, was of cleanly habits, and never gave any trouble. This is probably a case of sexual perversion, known as pederasty.

HYDROPS OF GALL-BLADDER

A second case record reported by Doctor Baldwin was of a female, age sixty, admitted to the Methodist Hospital, on the medical service of Dr. Paul Reiff, November, 1920. Her only complaint was a vague and continual discomfort in the upper abdomen and a sense of dragging and pulling in the right upper abdomen, especially on standing. A very careful study of her case was made by Doctor Reiff and a diagnosis made of gall-bladder disease with stones probably present. A number of negative X-rays were taken for gastro-intestinal and gall-bladder study. The patient was transferred to the surgical service and operated upon by the speaker December 14, 1920. On exposing the gall-bladder region the gall-bladder could neither be seen nor felt. In exploring downward to bring up the appendix a firm, irregular mass was encountered resembling a malignant growth of the ascending colon, which proved, however, to be a gall-bladder nine inches in length, five inches in circumference and tensely distended with fluid, a case of hydrops with large stones. There was a sort of meso-gall-bladder about four inches wide, and when the gall-bladder was brought out of the incision it stood five inches above the surrounding skin. A cholecystectomy was very easily done and the patient made a quick and uneventful recovery and has remained well since. It was interesting to find out why these large stones did not show in the X-ray pictures. Was the composition of the stones at fault or was the failure due to the fluid in the gall-bladder? It is claimed that stones will not show if there is much fluid, as there was in this case. The radiographic research showed that

it was not the composition of the stones. Therefore it is believed the failure of the stones to show while in the patient was due to the fluid tensely distending the gall-bladder.

HERNIA OF FEMALE REPRODUCTIVE ORGANS INTO THE INGUINAL CANAL

Dr. Henry P. Brown prefaced the report of an instance of the above complication by remarking that hernias of the ovary or ovary and tube, or ovary, tube and uterus in the inguinal canal, present a rather unusual and interesting variation from the usual variety of inguinal hernia. Not infrequently one finds an ovary situated in this region, its presence here being due to a congenital defect in development.

Cranwell,[1] quoting Herwig, states that when the Wolffian bodies commence to atrophy during the third month of fetal life, the ovaries descend from the lumbar region into the false pelvis, being in contact with the psoas muscle. It is probable that the inguinal ligament of the Wolffian body acts on them, as Hunter's gubernaculum, the gubernaculum testis, does on the testicle. The later position in the descent of the ovaries differs from that in the descent of the testicles in that instead of being arrested in the inguinal region, the ovaries descend normally into the true pelvis.

In certain exceptional cases the ovaries are able to comport themselves as the testicles, coming to lie in the inguinal region opposite the canal of Nuck. Sometimes they stop here, but they are also able to engage themselves within the abdominal wall, traversing the inguinal canal. The ovary is thus able, in imitating the testicle in its descent, to enter the inguinal canal and also engage the uterus, especially if the latter is bicornuate due to an abnormality of development.

In most cases only the ovary is engaged, but several instances have been reported in which a Fallopian tube and the uterus have accompanied it.

Doctor Jopson[2] reported such a case and gave a very good review of the literature up to that time. Royster[3] has recently reported another, reviewing the literature up to last year.

Most of the recorded instances occurred in women who had been pregnant one or more times, and most writers agree that this is an important factor in producing the condition. Some of the cases, however, were in women who had never borne children.

A severe sudden abdominal strain is an important predisposing factor and was mentioned as having occurred in several of the cases.

In the case reported the uterus, both tubes, and ovaries were contained in the sac.

An apparently healthy, normally developed colored child of five months was first seen in the dispensary of the Children's Hospital on Doctor Jopson's service on June 4, 1921, to whom the speaker is indebted for the privilege of operating upon it. She presented swelling in the region of the left labia about the size of a small almond, which her mother said had been present since birth. The mother stated that the

birth had been normal and the swelling had not varied in size, was unaffected by the child crying and had never disappeared.

Examination showed a rather firm, somewhat movable, but irreducible mass in the region of the external ring, not tender on pressure, constant in size and not transmitting any impulse when the child cried. The child was apparently otherwise normal in every respect. A tentative diagnosis of hernia of the left ovary was made.

Early in the morning on the day set for operation, the child had a severe crying spell, and on examination the nurse noticed that the mass in the inguinal region had become very much larger. It was thought that a knuckle of bowel had become forced into the sac.

At operation, under ether anæsthesia, the usual Bassini incision was made, opening the inguinal canal and exposing a well-developed sac which extended into the labia. The sac was opened and found to contain the uterus, both tubes and both ovaries, apparently normally developed for a child of that age.

The hernia was of the indirect type and its contents were easily reduced after relieving a moderate constriction at the internal ring. An area on the inner wall of the sac was very suggestive as being part of the urinary bladder and the sac was therefore not completely removed. The canal was closed after the Ferguson method and the child made an uneventful recovery.

Undoubtedly the strain incident to the crying spell was the factor which caused the uterus and its appendages to be forced into the hernia sac, this being in accord with the strain mentioned in most of the cases.

It was not absolutely certain that part of the bladder was present in the sac, especially as the hernia was of the indirect type, but from the appearance of that part of the sac, the slight difference in color, increased thickness and the sensation on palpation, it was at least very suggestive.

Doctor Jopson, in discussing the subject of hernia of the uterus, stated that in 1904 he had made an exhaustive study of this subject and compiled from the literature what he believed at that time to be a complete list of the cases in which the uterus had been observed to be present in the sac of an inguinal or femoral hernia. The ventral forms, which are the most frequent and which result from separation of the rectus muscle during pregnancy, were not considered. The earliest case of hernia of the uterus was observed by Nicholas Pol in 1531. There had been twenty-one instances reported up to 1904, his case being the twenty-second. Of these nine occurred in association with pregnancy. Pregnancy may occur in the uterus before or after it becomes herniated. There were also two undoubted cases of femoral hernia of the non-pregnant uterus. In many of the cases some malformation or lack of development of the genital organs was present. Eight cases of hernia of the non-pregnant uterus had been operated upon previously. In the more youthful cases the contents of the sac could usually be reduced. Since this report was made several articles on the subject had appeared, including more or less comprehensive ones by Cranwell, of Buenos Aires,

in 1908, and Sutton in 1909. Cranwell collected forty-five cases and Sutton fifty cases. The speaker had either overlooked, or was unable to obtain at that time, Oge's paper published as a thesis in Paris in 1900. Both it and Cranwell's and Sutton's papers are quoted in the most recent article which has appeared on the subject, namely that of H. A. Royster (1920). Royster, and Sutton and Upton, whom he quotes, dwell on the frequency of congenital malformations in associations with this hernia. In very few cases is the diagnosis possible before operation. It might be suspected if a hernia was found in association with atresia of the vagina or other perceptible external malformations or lack of development, and in young female children especially. Hernias of unusual type should be studied with the view to the detection of this malformation or of what is more common, hernia of the ovary alone.

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[2] Jopson: ANNALS OF SURGERY, July, 1904, p. 99.
[3] Royster: South. Med. Jour., April, 1920, p. 275.

INTRAPERITONEAL RUPTURE OF THE BLADDER

DR. T. TURNER THOMAS read a paper with the above title.

TUBERCULOSIS OF ELBOW CURED BY X-RAY

DR. G. M. DORRANCE showed a man, age forty, with a history of tuberculosis of the left knee and hip-joint that had been cured in childhood.

Patient was under the speaker's care for one year previous to the administration of X-ray treatment. When first seen he had tuberculosis of the right elbow-joint with numerous sinuses leading down to diseased bone. The X-ray plates showed marked destruction of the lower end of the humerus and entire involvement of the joint. On account of scar tissue from former operations, an excision of the joint was impossible. Removal of bone and curetting of the sinuses was performed several times. Bier's hyperæmia was used. X-ray treatments were given first at three-day intervals and later at seven-day intervals. The sinuses rapidly closed and have not reopened. It is shown as an adjunct to the usual surgical procedures used in tuberculosis of joints.

AVULSION OF PALM

A second case, presented by Doctor Dorrance, was of avulsion of the skin and subcutaneous tissue of the palm treated by abdominal pedicle graft occurring in a man, age twenty, admitted with a history of crush of the hand and loss of the skin and subcutaneous tissue of the palm.

Examination showed the skin and flexor tendons exposed and arteries pulsating. The skin and subcutaneous tissues were lost from one inch below the flexor crease at the wrist-joint to one inch above the metacarpal phalangeal crease and extending almost out to the lateral margins of the

palm. The wound was treated for four days with dichloramin-T and then an abdominal flap of skin was reflected up and sutured to the edge of the palm. On the tenth day, the flap was partially divided from its abdominal connection. Each day thereafter more was divided until the pedicle was completely divided. This skin has gradually contracted from the sides towards the centre so that now the graft is about two-thirds as large as it was when the sutures were removed. Twelve weeks have elapsed since the operation and sensation is gradually returning in the graft.

SKIN TENSION BUTTONS

DOCTOR DORRANCE presented the above apparatus with the following description: The value of these buttons is that they have two points of contact with an intervening concave surface that gives some support but allows sufficient blood to enter to prevent necrosis. The ends and sides are slightly everted to limit as much as possible the so-called digging in of the buttons.

The slot at the end allows the mattress suture to be applied without the necessity of attempting to pass the needle and suture through an eye at either end. When the sutures are all inserted and ready to tie, the buttons are put in place. They may be used as an ordinary mattress or an end mattress.

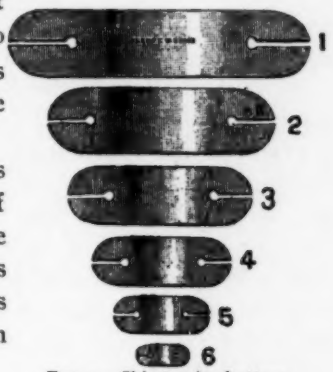

FIG. 2.—Skin tension buttons.

TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

Stated Meeting Held January 25, 1922

DR. EUGENE H. POOL in the Chair

THE RELATIVE MERITS OF GASTROSTOMY AND JEJUNOSTOMY IN CANCER OF THE CARDIAC END OF THE STOMACH

DR. NATHAN W. GREEN presented two cases to bring out discussion as to the relative merits of gastrostomy and jejunostomy in cancer of the cardiac end of the stomach. In this class of cases the patient may sometimes be too ill to undergo an operation for gastrostomy or the stomach may be too contracted to allow of the formation of a suitable stoma. In this event the jejunostomy is better. It takes less time and in these very enfeebled cases it performs the function of a stoma with the minimum of surgical trauma. It has this disadvantage, it will easily become so closed should the feeding tube be withdrawn too long that it will be very difficult to reinsert the tube. This also may be said of the Kader-Senn type of gastrostomy, where the stoma tract is lined with connective tissue following the disappearance of the single layer of endothelial cells of the peritoneum. The advantage of the gastrostomy of the Janeway type is that it makes a permanent tube lined with the mucosa of the stomach which leads from the stomach to the skin. This type of gastrostomy is most suitable in cancer of the cardia, as it does not close spontaneously and has the advantage that should the patient leave out his tube for a considerable time it can be reinserted without difficulty.

CASE I.—A male, fifty-seven years of age, was X-rayed August 31, 1921, and the diagnosis made at that time of obstruction of the œsophagus with a filling defect involving the cardiac end of the stomach about the orifice of the œsophagus. He stated that in June, 1921, he felt a sense of fullness at the cardiac end of the stomach after meals, which was followed by dull pains radiating to the left side. He had a series of X-ray treatments, five in number, by Doctor Herendeen, of the Memorial Hospital, and was admitted to the City Hospital, where a Janeway gastrostomy was done by Doctor Green, October 23, 1921. No metastasis was found in the liver at that time. The patient has had no X-ray treatment since November.

CASE II.—A male, forty-eight years of age, was first seen at the Memorial Hospital on November 4, 1921. He was in fairly good condition. An indefinite mass was felt in the mid-epigastrium which was slightly tender. For the past six years he had had frequent attacks of cramp-like pain in the abdomen with occasional bloody vomiting, loss of weight, and weakness. A röntgenogram taken November 12, 1921,

showed a filling defect on the lesser curvature of the stomach. He also gave an indefinite history of dysphagia. On November 21, 1921, he was admitted to one of the wards of the Memorial Hospital and was operated upon on November 23rd. There was a mass in the cardiac end of the stomach, the size of an egg, and the lymph-glands were found involved. A jejunostomy was done, using the Witzel method. He was discharged December 14, 1921, and was referred to Doctor Herendeen for a cycle of X-ray treatments, which will be given very shortly.

JEJUNOSTOMY IN ULCER OF THE LESSER CURVATURE AND POSTERIOR WALL OF THE STOMACH

DR. WILLIAM A. DOWNES presented a boy eighteen years of age, to demonstrate the value of jejunostomy in this class of cases. On March 3, 1921, he was admitted to the medical service of St. Luke's Hospital suffering from a three weeks' attack of epigastric pain and vomiting. There was low red blood-cell count and blood was found in the fæces. X-ray examination revealed a marked deformity of the stomach, gastrospasm being indicated at the pyloric end and at the lesser curvature, the appearance of the latter suggesting the possibility of perforating ulcer. A provisional diagnosis was made of bleeding ulcer of the stomach located on the lesser curvature and posterior wall. The patient was acutely ill, with lips and mucous membrane ashen gray. He was very much undernourished and was put on an ulcer diet (Bastedo) and given two blood transfusions. Only slight improvement followed and, his general condition growing worse instead of better, operation was decided upon, and March 25th, under gas and oxygen anæsthesia, an exploratory gastrostomy and jejunostomy was done, a five-inch incision being made in the upper right rectus. There were dense perigastric adhesions between the lesser curvature of the stomach, the parietal peritoneum, and the liver. A large indurated mass was felt which involved the lesser curvature and posterior wall of the stomach and was apparently adherent to the pancreas. The ulcer crater was exposed by a three-inch incision in the middle of the anterior wall of the stomach. The ulcerated area was about three inches in diameter and extended well up on the posterior wall and lesser curvature. Excision was impossible on account of the size and location of the ulcer, so the opening in the stomach was closed by a continuous suture of chromic catgut. Because of the fact that absolute rest of the stomach was necessary in order to control the bleeding which was an important indication, as well as on account of the extent and location of the ulcer, it was decided to perform a jejunostomy, thereby placing the stomach at absolute rest. Feedings through the tube in the jejunum were begun in twenty-four hours, four ounces of milk being given every two hours, gradually increased to eight ounces, with addition of eggs, meat juice, and cereal. Small quantities of water were allowed by mouth. Continuous Murphy drip of five per cent. glucose. Three post-operative transfusions were given at intervals of two weeks. Three months after operation the red blood-cell count had increased and the stools were negative for blood. On July 1st he was discharged

from hospital, having gained ten pounds in weight, and his general condition being much improved. He returns to the hospital weekly and appears to be in excellent health. The tube has been removed from time to time to be cleansed; there has been no irritation of the skin and no leakage from the stoma. He has gained thirty-six pounds in weight and has returned to his work as a chauffeur. The large gastric ulcer has apparently healed and the stomach functions well when filled with a full opaque meal. To be certain of the permanent healing of the ulcer the jejunostomy will be kept open for at least one year from the date of operation.

Dr. Walton Martin thought that these cases illustrated several points well worth considering. In the first place, it is not simply a question of the advantages and disadvantages of jejunostomy and gastrostomy. Doctor Green's cases illustrate a particular method of making a gastrostomy. He used the Janeway procedure which is admirable if a permanent opening is sought, lined with mucosa, with little or no tendency to close, but the method has the disadvantage of requiring half an hour or more to perform—a serious matter in weak and half-starved patients. The question as to when to do a simple gastrostomy and when to do a jejunostomy should be determined largely by whether or no one wishes to give absolute rest to the stomach, or whether nutrition alone is to be considered. It is surprising to see how little the skin is irritated in the jejunostomies. Doctor Downes' case is an example of very sound judgment in selecting the proper operative procedure. The improvement in this patient has been astonishing.

Dr. Joseph Wiener said it was of no consequence, if one used local anæsthesia, how long it took to do an operation. He had not recently done a gastrostomy or jejunostomy under ether and it was entirely unnecessary. He had done a number of gastro-enterostomies under local anæsthesia lately with happy results, and with these debilitated patients that should be kept in mind.

Dr. James I. Russell had no experience with the Janeway gastrostomy, having never done it, but he has used the Kader-Senn method a number of times, under local anæsthesia, during the past few years. Most of these patients have had carcinoma of the lower end of the œsophagus and the cardiac end of the stomach. It would seem that they improve for a little while and then gradually grow weaker and die. He was glad to know that Doctor Green's patient was able to walk about. As for Doctor Downes' case, he had a similar one recently, a young man eighteen years of age, who had had profuse hemorrhages and was in very bad condition at the time of entering the hospital, suffering excruciating pain. He was transfused three times, after which he improved sufficiently to have a posterior gastro-enterostomy done under gas oxygen. He stood the operation well, the pain became much less, the bleeding stopped, and at the end of a month he was discharged from the hospital. He had greatly improved, was quite free from pain, and no blood could be found in the stools. The ulcer was a large indurated one

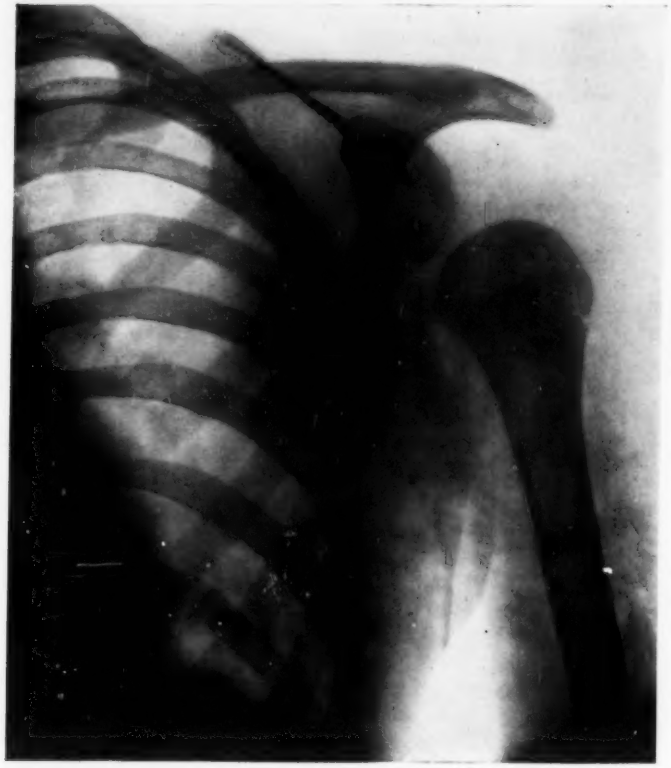

FIG. 1.—Radiograph showing persistent subglenoid dislocation of shoulder.

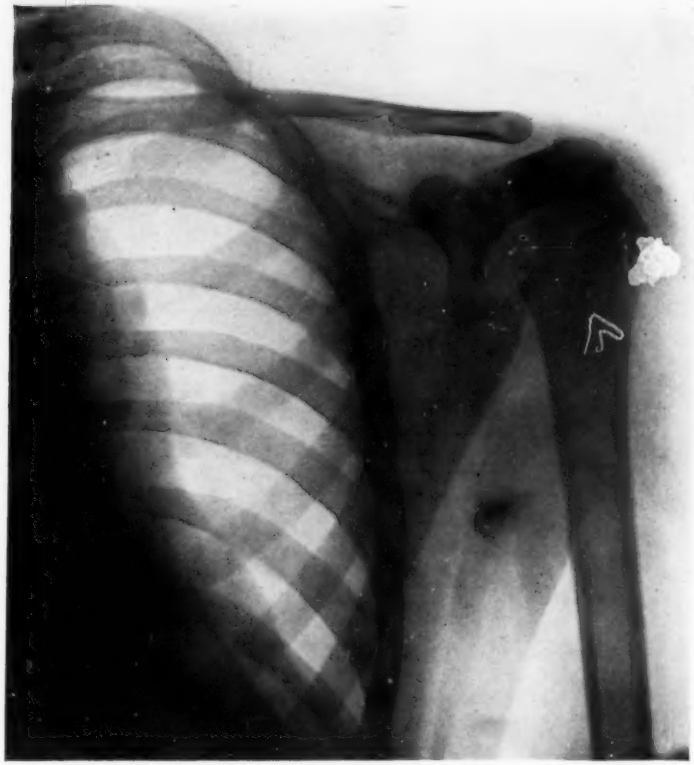

FIG. 2.—Radiograph showing condition of shoulder after capsulorrhaphy.

located on the posterior surface of the first portion of the duodenum and it could not be excised.

Dr. Edward W. Peterson thought that the point Doctor Green wished to make was that the Janeway type of gastrostomy was preferable where a permanent opening was desired. In carcinoma of the œsophagus or cardia the Janeway operation is ideal because the patient has a mucous-lined tube leading from skin to œsophagus, which will not close spontaneously if the rubber tube is withdrawn. A word of caution should be spoken, however; occasionally a stomach was so contracted from disuse that it could not lend itself to the proper performance of a Janeway gastrostomy.

Doctor Downes, in closing the discussion, said that he believed jejunostomy was preferable to gastrostomy for two reasons: First, it gives the stomach complete rest, thereby lessening the tendency to bleed, and also relieves pain; and secondly, it does not leak. If there is no blood in the stools and if the stomach functions properly, at the end of one year the tube will be removed and the patient left alone. The wisest thing to do is to treat a patient as a cured case when the stools no longer contain blood.

CAPSULORRHAPHY FOR PERSISTENT SUBGLENOID DISLOCATION OF SHOULDER

Dr. DeWitt Stetten presented a little girl eleven years of age. As a younger child she had several dislocations of her left shoulder induced by rather trifling trauma. The dislocation was always easily reduced and the head of the humerus remained in place after reduction. About the middle of July, 1921, while at camp, she injured her left shoulder. A dislocation is supposed to have occurred which was reduced but apparently the head of the humerus did not remain in position.

When first seen in September she had a subglenoid dislocation of the left shoulder. The head of the humerus could be felt in the axilla and there was a marked depression between it and the tip of the acromion. There was not very much pain, but motion, especially adduction, was decidedly limited. This dislocation was very easily reduced even by the patient, who could pull the head of the bone into the socket by a contraction of her deltoid. As soon, however, as she allowed her muscles to relax the dislocation recurred. There were no indications of any paralyses.

X-ray examination shows a not quite complete subglenoid dislocation of the head of the humerus. There is no evidence of bony injury.

After an unsuccessful attempt to cure the deformity by bloodless reduction and fixation, operation was decided upon. The operation was performed on October 14, 1921. The usual anterior curved incision over the shoulder was made. After separating the fibres of the deltoid, a very much relaxed and somewhat thinned capsule was exposed. Without opening the joint, the capsule was reefed by two layers of interrupted chromic catgut sutures. The suture line extended from the axillary portion of the capsule to a point as far posteriorly as could be reached. Redislocation was attempted after the capsulorrhaphy, but was unsuc-

cessful. The wound was closed and a modified Velpeau bandage applied.

X-ray examination, after operation, showed the head of the humerus in good position in relation to the glenoid cavity, slightly higher than normal.

The wound healed by primary union. The arm was kept immobilized for a period of six weeks and then gradual active motion encouraged. The mobility of the joint slowly returned to normal and there has been no tendency toward dislocation since the operation. The skin scar shows some keloid formation, which is, however, diminishing.

DR. ALFRED S. TAYLOR inquired if there was any history of paralysis, in the first case, of the muscles around the shoulder. Also if examination had been made to determine if there was loss of power to account for the persistent dislocation. It did not seem possible that this could repeatedly occur if the muscles were all right. It was significant that, after suture of the capsule, the arm was immobilized for a time in a position relaxing the weakened shoulder cap muscles. This period of time was about the same as that required by nerves partially paralyzed by overstretching (an event not uncommon in just this type of fall) to recover their function.

DR. ROYAL WHITMAN thought that the disability caused by the displacement would account for the atrophy as there appeared to be no evidence of paralysis.

DOCTOR STETTEN replied to Doctor Taylor that no electrical examination for paralysis had been made in the case as it did not seem necessary. The muscles were roughly tested by active motion and appeared to functionate satisfactorily. The history of repeated traumatic dislocations and the absence of any history of polymyelitis tended to eliminate a muscular paralysis as an etiological factor. The deltoid, though somewhat atrophied now from disuse, was never paralyzed. In fact, before the operation if the patient voluntarily contracted her deltoid it actually pulled the head of the bone into place and when she relaxed it the head of the bone fell out of the socket so that one could put the finger between the head of the bone and the tip of the acromion. Immediately after the stretched capsule was reefed, attempt at dislocation during the operation was unsuccesful. This would also tend to prove that the actual stretching of the capsule and not a muscular paralysis was the causative lesion of the disturbance.

LONGITUDINAL SECTION OF PATELLA FOR JOINT MOUSE IMPACTED IN INTERCONDYLOID NOTCH

DOCTOR STETTEN presented a man twenty-four years of age, who for some time had had trouble with his left knee, which would occasionally lock but usually unlocked without any difficulty. Five days before Doctor Stetten first saw him the knee suddenly locked in a moderately flexed position. Since that time the patient has been unable to unlock the knee.

Examination showed a knee flexed at an angle of about 135 degrees. The joint could be further flexed but could not be further extended, either actively or passively. It was not possible to unlock the knee by manipulation. There was a slight effusion in the joint. Somewhat above and to the outer side of the patella one occasionally felt a small loose body which slipped from under the fingers.

X-ray examination shows a small, elliptical shadow above and to the outer side of the patella and another larger, more irregular one in the intercondyloid notch. These shadows are fairly opaque and are unquestionably joint mice.

Operation was performed on May 30, 1921. The Jones' operation was decided upon as the most satisfactory method of approach. This incision would give access to the intercondyloid notch without damage to the extensor apparatus of the knee-joint and would be the most feasible in the face of the taut quadriceps and patella tendons. Accordingly, using a tourniquet, a longitudinal incision was made over the patella with the knee hanging over the edge of the table in its flexed position. The patella was exposed and the quadriceps and patellar tendons were divided longitudinally. The patella was divided longitudinally with a saw and the joint opened. The halves of the patella were dislocated laterally over the respective inner and outer condyles. The smaller joint mouse was easily found in the outer pocket of the quadriceps bursa and removed. Another, somewhat larger joint mouse, was found lodged in the intercondyloid notch, imbedded in the outer aspect of the inner condyle and wedged between the inner condyle and the corresponding joint surface of the inner tibial tuberosity. This was easily removed with a forceps and no further mice were found in the joint. The synovial membrane was then closed, the incisions in the quadriceps and patellar tendons were carefully sutured, as was likewise the periosteum over the patella. The bone was not sutured. The skin was closed and a posterior splint applied to the easily extended joint.

The wound healed by primary union, and after six weeks massage and gradual passive motion were ordered. The joint rapidly regained its mobility and in three months after operation function was normal, with solid bony union of the patellar halves.

Dr. Hermann Fischer said that he recently had made use of the Jones operation for opening the knee-joint for the removal of a joint mouse. The X-ray picture showed a loose cartilaginous body in the upper recess of the joint. Although the joint mouse was of a large size, it could not be felt. Opening of the upper recess of the knee-joint by a longitudinal incision failed to disclose the body. In order to explore the joint thoroughly, the incision was prolonged downward over the middle of the patella by sawing and the two halves were pulled apart by retractors. The access into the joint was excellent, but again he failed to locate the loose body. It was finally found tucked away in the upper recess of the joint, encapsulated in a reduplication of the very much thickened and chronically inflamed synovial membrane. The

closure of the joint was very simple. It was not necessary to put sutures through the patella; the two halves came in close contact by a chromic catgut suture of its thickened periosteal covering. The advantage of this method of entering the knee lies in the fact that the extensor apparatus is not at all interfered with. In this case the knee was only immobilized for ten days, then careful passive motion, and four days later active motion was begun. Three weeks after the operation the normal range of motion without pain was restored.

Dr. William A. Downes asked Doctor Stetten if he did not think six weeks was too long a time to immobilize the joint in this case, on account of the danger of the formation of adhesions and the unnecessary delay in convalescence.

Dr. Royal Whitman thought that immediate movement of a joint after operation with the aim of thereby preventing adhesions and limitation of motion was a mistake. Sufficient time should be allowed to permit primary union before resuming function.

Dr. Joseph Wiener agreed with Doctor Downes rather than with Doctor Whitman. In the old days there were disagreeable results following immobilization of fracture of the patella, for there is difficulty in getting motion after six weeks of immobilization. Early motion in these cases may be wrong, but therapeutically it is entirely right.

Dr. Eugene H. Pool considered that most physicians allowed motion for fracture very much earlier than formerly, and in fracture of the patella particularly they were beginning to allow active motion in bed within several days of operation, and the results have not been disadvantageous, but have been beneficial. If that could be done with a transverse fracture, it would seem that one could do as much safely with longitudinal section of the patella. He asked Doctor Stetten if any disadvantages or complications had been reported following this method.

Doctor Stetten, in closing the discussion, regretted that he had been misunderstood as having said that he immobilized the knee for six weeks. He had left the splint on for only three weeks and after that allowed the patient to move the knee in bed. He did say, however, that after six weeks massage and gradual passive motion were ordered. He had been somewhat conservative, as this was his first experience with the operation and he had not wished to take any chances. He felt that it was not easy for the two patellar halves to separate after suture of the dense quadriceps and patellar tendons. He thought the best answer to the statement that conservative treatment might impair the eventual mobility of the joint was the perfect function of the knee in this case. This returned very quickly after the patient began walking around. Doctor Stetten said that his first experience with this method had led him to believe that this was the very best means of approaching the centre of the knee-joint, giving the greatest possible exposure without in any way damaging the extensor apparatus.

ANOMALOUS ABDOMINAL MEMBRANES. THEIR INFLUENCE UPON THE DIGESTIVE TRACT

DR. ALFRED S. TAYLOR read a paper with the above title, for which see page 513, May ANNALS OF SURGERY, vol. lxxv.

DR. WILLIAM A. DOWNES mentioned two or three cases which he had observed at the Babies' Hospital in which the first portion of the duodenum had a short mesentery, which bore out Doctor Taylor's contention as to this condition being congenital. He showed on the blackboard a diagram of a case of non-rotation of the intestine which he considered corroborated Doctor Taylor better than anything he could mention. This baby was sent to the hospital for pyloric obstruction. At operation a definite band was found running across the duodenum just before it joined the jejunum; this band was divided, the obstruction was freed, and the baby made a perfect recovery. The band measured two and one-half inches in width. The speaker asked Doctor Taylor if he considered the patient cured who was also relieved of symptoms after the appendix was taken out three years before.

DR. EUGENE H. POOL thought that when much importance is placed upon the three types of bands or membranes, mentioned by Doctor Taylor, if a case fails to improve the surgeon is inclined to feel that not enough adhesions or bands had been severed. In subsequent cases he is therefore led to do more radical work. He believed that there was a tendency here to lead to a lot of dangerous operating. In Doctor Taylor's hands a number of cures would doubtless result from operations that would bring serious disaster to others.

DR. NATHAN W. GREEN considered that Doctor Taylor's paper showed a very great deal of thought and logical reasoning. The trouble with many surgeons was that when they undertook an operation for the cure of symptoms of indefinite origin they found several conditions in the pathology, any one of which alone might be accountable for these symptoms. They felt in order to render a cure, all of the findings must be corrected. They were unable to say that this band or that appendix or this gall-bladder alone was the offending cause. Therefore they removed all these and the result might be surgically good but scientifically somewhat inaccurate. Few have the moral courage to leave the gall-bladder and appendix, even if they appear normal, and merely divide the band.

DR. WALTON MARTIN was reminded of the remarks of Doctor Moschcowitz made some time ago in a discussion on the subject of operations for veils and adhesions and replacement of displaced organs. Doctor Moschcowitz said he felt confused. There were surgeons who were enthusiastic supporters of fixing the stomach and colon or reefing the cæcum and there were other surgeons equally enthusiastic in freeing the colon and dividing adhesions for a group of patients presenting similar symptoms and presenting a similar anatomical picture. As to the adhesions and peritoneal folds about the cæcum, he thought it most difficult to say what was normal and

what abnormal. Many years ago he had examined the ileocæcal region systematically on the cadaver for Professor Huntington and tabulated the results. Professor Huntington was interested in the cæcal fossæ and the folds. In several hundred examinations there were very few that presented the three normal folds, an upper vascular, an intermediate non-vascular and a lower vascular, with the adhesion of the intermediate non-vascular with the lower vascular. The arrangement which was normal at birth had become modified by secondary adhesions and bands in nearly every instance.

For his part Doctor Martin said he found it often very difficult to say that a given adhesion was an abnormal adhesion, both regarding those in the region of the first portion of the duodenum and in the ileocæcal region. He did not refer to well-marked obstruction from a definite band but to veils, broad non-vascular bands and adhesions. It is often a matter of nice judgment for each surgeon to decide for himself whether a given band or adhesion is giving clinical symptoms, and possibly the decision depends somewhat on the enthusiasm, optimism and preconceived notions of the surgeon himself.

Dr. J. P. Hoguet referred to the question of these bands having been brought up by Morris in 1902, who gave to them the name of "gall-spider cases"; and by Harris, in 1914, who reported some with the bands across the duodenum. In Doctor Hoguet's opinion they were all purely developmental from the embryological anterior mesogastrium. Many such cases are seen in the dissecting room even in very young subjects and presumably never gave symptoms. He had operated on a number, however, in whom the symptoms were very marked and who were relieved by operation.

Dr. W. W. Herrick expressed the medical point of view in these matters as being one of inquiry and not as yet of unreserved acceptance. In his own work in the study of chronic digestive disturbances, with the aid of fluoroscopy, he had not been impressed with the frequency of these cases, although the work of Doctor Taylor was highly suggestive of new fields of diagnosis. One or two physiological questions had occurred to him while listening to the reading of Doctor Taylor's paper. Are not conditions in the digestive tract in a normal state different from those presenting themselves under an anæsthetic when the abdominal cavity is opened? Care in exerting unusual torsion on normal membranes and ligaments would seem advisable, and the differentiation of normal and abnormal bands most difficult. Careful X-ray study would certainly throw light on such phases of the question. This is a very suggestive and valuable work and is of great importance to the internist.

Doctor Taylor, in closing the discussion, took up first the question regarding the cure of these cases. He did not consider any patient permanently cured until he was dead without having suffered a recurrence of symptoms. The point was that he did not report any case less than two years after operation and some had been operated upon seven years ago, and the cases were reported as to cures, etc., up to date. The thing that had been most interesting

to him was that from some of the group that had not been heard from in two years and that he had put down as "improved," he got reports, after this paper went to the printer, stating that they were better after five years than they had been after two years. The second case presented this evening has been well for three years, and eight weeks after the day she was operated upon she was back doing her work. Of all the cases, eighty-six per cent. are very much better than they were before operation, thirty-two per cent. of the fifty cases being complete cures to date. With regard to the suggestion that it is dangerous to get surgeons interested in doing this operation, the mortality rate refutes this. There was only one death in the fifty cases and this patient died of post-operative pneumonia; so as to danger, this operation ranks very low. With regard to Doctor Martin's discussion, it is true that these conditions have been treated in a great variety of different ways with good results. There was one surgeon who sutured the cæcum and entire colon in the position he thought normal and reported a good result. The thing that had impressed the speaker was this: given a digestive tube, it does not make so much difference what its position in the abdomen may be, so long as it is not sharply kinked or compressed. These membranes cause kinking and so obstruct the flow of the contents, and if one can make the tube mobile by plastic procedure, the symptoms will be overcome. He had confined his attention to section and plastic suture of the membranes, trying thus to mobilize the gut. He believed with Doctor Martin that it was difficult to pick the normal. Too little attention has been paid to the membrane above the cæcum proper; the membranes distal to the cæcum usually cause dilation of the cæcum and secondary distention of the appendix, and frequently cause dilation and incompetency of the ileocæcal valve. Whether or not these conditions are abnormalities is a question for discussion. These conditions as seen on the operation table impressed him as abnormal. When the gut is freed one can see it fill so promptly as to indicate that there must have been real obstruction. Doctor Hoguet's remarks on his observations in the dissecting room are very interesting and corroborate the evidence presented in the paper. Doctor Taylor regretted that he had not had time this evening to go into all the side issues of the subject, but they are dealt with in the paper and those interested can follow them up. The conditions are real and it is of interest to know if operation has something to offer. If after a man has had experience with a number of cases, he can take the history, make a physical examination, study the X-ray plates, predicate in seventy-five per cent. of cases what is the condition, and then go into the abdomen and be able to verify the predictions, it would seem that there was a real pathological entity which merits careful study. When one releases these bands, which are apparently at fault, and the patients are relieved of their symptoms and keep improving in general health as time goes on, one would think there was a definite relation of cause and effect between these two series of events.

TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

Stated Meeting Held February 8, 1922

The President, Dr. William A. Downes, in the Chair

COMPLETE CAST OF THE STOMACH DUE TO BURN

Dr. Alexis V. Moschcowitz presented a young man who, with suicidal intent several weeks ago, swallowed a quantity of muriatic acid. Very excellent first-aid was given promptly and his life was preserved, but two weeks afterward on account of persistent vomiting he was referred to Mt. Sinai Hospital. A day or so before he came to the hospital he vomited a large amount of material which was saved, and on examination was shown to be a complete cast of the mucosa of the stomach. Towards the duodenal end the lumen was still retained. The patient suddenly stopped vomiting and for a long time was able to take considerable nourishment; however, while he is taking nourishment now, he is losing considerably in weight. During the early part of his stay in the hospital a jejunostomy was considered, but he took nourishment so well that this idea was abandoned for the time being. When it was considered safe, he was X-rayed. The œsophagus was found to be patent throughout; the stomach was much contracted, and there was some narrowing of the pylorus. A few days ago the patient was able to pass upon himself a full-sized stomach tube. He now vomits very frequently and there seems to be a constriction of the pylorus, although some food passes through. A more recent X-ray showed upon the much contracted stomach a peculiar nipple-like shadow which was not visible in the first X-ray, which may or may not be a penetrating ulcer. The chemical examination of the stomach contents failed to reveal the presence of hydrochloric acid or ferments. .

This patient was presented on account of the rarity of such injury, and to secure advice regarding future action.

Later Note.—(Since the presentation of the patient, he vomited a great deal, and continued to lose weight so rapidly that the conclusion was inevitable, that there existed an almost complete stenosis of the pylorus. He therefore was operated upon on the first of March. The entire stomach was found contracted so as to resemble a section of small intestine. The walls were densely infiltrated. The anterior surface of the stomach for a space of about two square inches, right at the cardia, was free from infiltration; a gastro-enterostomy done at this point. The only operation feasible was that of anterior retrocolic gastro-enterostomy, which was done with the aid of a Murphy button. The patient stood the operation perfectly well and thus far is doing well in every respect. He has not vomited once during the past ten days and retains all nourishment permitted.)

Dr. George Woolsey spoke of a patient who came to him two years ago after swallowing hydrochloric acid; he had uncontrollable vomiting, lost weight, and the X-ray showed marked narrowing of the pyloric end of the stomach beginning sharply two and one-half inches from the pylorus. A gastro-enterostomy was done and three months later he was in perfect health and had gained thirty-four pounds in weight.

Dr. Edwin Beer said that he had seen a complete exfoliation of the interior of the bladder following the use of mercurochrome, and much to his surprise there was no contraction of the organ as proven by subsequent operation. He had never seen a case of exfoliation of the mucous membrane of the stomach which, apparently according to the case presented, was behaving quite differently from the case in which a similar process took place in the bladder.

NON-ROTATION OF LARGE INTESTINE

Dr. Carl Eggers presented a woman, thirty years of age, who had been having attacks of cramp-like abdominal pain for the last ten years. The first attack confined her to bed for two weeks. Subsequent attacks were not quite as severe and of shorter duration. They were not accompanied by fever or vomiting. The present attack started a few days before admission to the Lenox Hill Hospital. At the onset the pain was general over the abdomen, but it had become more localized on the right side. There had been no fever or vomiting. She was a rather anæmic but well-nourished young woman. The abdomen was distended. There was no rigidity. No organs were palpable. There was tenderness on pressure over McBurney's point, and also on the left side.

Vaginal examination was negative except for tenderness in the right adnexal region.

Operation (August 14, 1920).—A three-inch Kammerer incision was made on the right side. Some clear free fluid found. Loops of small intestines presented. There was no omentum visible and search revealed an empty right lumbar gutter, no colon or cæcum seen. Incision extended upward for thorough exploration. To visualize the condition it was necessary to bring the small intestines out of the abdomen, and it was then found that the transverse colon was folded on itself from right to left, and that the cæcum and ascending colon were situated in the left side, resting on the descending colon, with the ileum entering the cæcum from the right side. An enormous appendix, a hydrops, larger than a thumb, was found and removed in the usual way. In order to relieve the attacks of pain it was decided to place the intestines into the position considered normal. Before doing this, further examination was made and the following points were noted:

The cæcum and the ascending colon had a very long mesentery. The duodenojejunal junction was situated on the right side of the mesentery. The liver was on the right side. In order to replace the gut, the small intestines had to be completely drawn around, as they were evidently

rotated. They were held directly upward by an assistant by means of a hot towel and the transverse and ascending colon with the cæcum were then placed into their normal position. This was easily accomplished on account of their long mesentery. After replacing these the small intestines were put on to the now anterior leaf of the mesentery. No attempt was made to fasten the cæcum or ascending colon into place, first, because it was assumed that the small gut resting on their mesentery would hold them there, and secondly, because no obstacle should be placed in their way in case they wanted to resume the position they had occupied during the last thirty years.

The convalescence was uneventful. There was no unusual gas disturbance.

The subsequent course has been marked by occasional cramp-like pains, never as severe as before operation. An X-ray study made September 14, 1921, by means of a bismuth meal and also a bismuth enema, shows that the cæcum and colon have remained in the position in which they were placed. There is some redundancy of the colon. During the application of the enema there was no suggestion of any obstruction and no complaint on the part of the patient about discomfort.

Dr. Ellsworth Eliot, Jr., said he had had a case of acute appendicitis complicated by an anatomical condition of this kind which was interesting for two reasons. While the patient was twenty-four years of age, she had previously never had the slightest abdominal disturbance. Secondly, while prior to operation the symptoms of peritoneal irritation were most marked in the right lower quadrant, the ileocæcal junction with the appendix was found just above and to the left of the umbilicus. This discrepancy between the site of the appendix and the area of maximum rigidity was accounted for by the fact that the seropurulent exudate had accumulated in the lower right portion of the peritoneal cavity. This patient was discharged after convalescence and there was no record of the permanent result. No attempt was made to restore the ileocæcal junction to its usual position.

Dr. William A. Downes spoke of a case of non-rotation in an infant referred to him as a case of pyloric stenosis. At operation a band two inches wide, running across the lower duodenum, was divided, the intestine was freed and the baby made an uneventful recovery.

ACUTE PYELONEPHRITIS COMPLICATING APPENDICITIS

Doctor Eggers presented a girl of nineteen, who was admitted to the Lenox Hill Hospital July 30, 1921, for an interval appendix operation. She had just passed through an acute attack of appendicitis at home. On admission all acute symptoms had subsided, and temperature, pulse and blood-count were normal. Tenderness over the appendix was still quite marked. On account of increased frequency in urination operation was delayed until the urinary tract could be excluded. Urine found normal. No kidney tenderness.

Operation (August 1, 1921).—Appendectomy in usual way. No drain required. For three days after operation the patient was unable

to void and had to be catheterized. Except for that the post-operative course was normal until the seventh day, when she had two chills lasting about twenty minutes each. The temperature rose to 103. Coincident with this she developed severe pain in the left lumbar region, radiating downward along the ureter, accompanied by frequency and burning urination. There was rigidity of the left lumbar muscles. The urine was clear, but contained albumen and clumped pus-cells. High temperature, pain and urinary symptoms continued. X-ray for stone was negative. The cystoscope showed the bladder capacity normal. Both ureter openings normal, clear urine obtained from both sides in approximately equal amount. Phenolphthalein excretion appeared in fourteen minutes on the left side, seventeen minutes on the right side. Sterile urine specimens from both kidneys and the bladder. All three showed colon bacilli. A diagnosis of bilateral colon infection of kidneys was made, more severe on the left than on the right side.

There was no improvement in the symptoms, pain was severe, blood examination showed white blood-cells, 16,000; polymorphonuclears, eighty-five per cent. There was marked tenderness over the left kidney.

Operation—Decapsulation of Left Kidney (August 22, 1921).—In order to properly expose the kidney, it was necessary to resect the twelfth rib. The kidney was enlarged and more adherent than normal. There was no free pus. The surface of the kidney was studded with many small abscesses. A decapsulation was done. Two of the small abscesses were cultured and showed colon bacilli. A cigarette drain was placed at the lower pole of the kidney and the wound then closed.

Immediately after operation all pain ceased. Patient was able to void normally. Except for a chill and a short febrile period, September 4th to 7th, there was no disturbance of convalescence. Patient was discharged in good condition and has since remained well.

Dr. Charles H. Peck believed this case to be an example of a common condition, an acute hæmatogenous infection of the kidney rather than a true pyelonephritis. This is a complication of many infective conditions. Many of these cases will subside without operation, and he believed Doctor Eggers had shown good judgment in decapsulating instead of removing this kidney. Some years ago when the speaker had seen kidneys presenting the appearance much as Doctor Eggers described them with multiple dots, he took these kidneys out and the patients made good recovery, but he knew later on that he could have saved the kidney just as well. Many go through a sharp inflammatory reaction and if left alone they will subside spontaneously without any surgical interference at all. Another group become perinephritic abscesses. He had operated on one in which a cortical kidney abscess was at the point of rupture. He had watched a number of these cases with acute tenderness and high fever, often running to 105°, and a large percentage had subsided spontaneously. They show the urinary findings that Doctor Eggers reported, a few pus and a few blood-cells only. It is not an inflammation of the urinary tract but of the cortical parenchyma of the kidney.

DR. NATHAN W. GREEN referred to a case under his care about twelve years ago at the City Hospital, a young girl of seventeen, who had right-sided pain over the kidney. He decapsulated the kidney and found it spotted with red hemorrhagic spots one-half cm. in diameter and some of these spots had a yellow centre. He thought decapsulation was enough and drained down to the site of the kidney. She ran the usual history of temperature and made a smooth convalescence from the right-sided trouble. Then without much of an interval she started up a left-sided pain with a picture similar to the preceding. The left-sided condition was left entirely alone and it subsided without operative interference in about the same time as the right side.

DR. EDWIN BEER said that there is a very definite distinction between colon and coccic infections of the kidneys. The former are usually associated with pyuria and, unless obstruction of the outflow of urine is present, rarely require operation and, then, usually only decapsulation. On the other hand, the coccic infections rarely show more than a few red blood-cells in the urine and are liable to produce perinephric abscesses as they perforate into the perinephric tissue. The more violent cases require early operation before perinephric perforation takes place and at times even nephrectomy may be required to save the patient's life; in some cases nephrotomy and opening of the abscess, and in others, resection of the septic area have led to satisfactory results. In those cases where the two types of infection are associated, the diagnosis is particularly difficult and, despite the presence of colon bacilli and pus in the urine, if the patient's condition does not improve rapidly on flushing, it may be necessary to arrive at the conclusion that one is dealing with a mixed infection and, therefore, be compelled to operate.

DR. WILLY MEYER cited a case that he treated many years ago. The patient was a lady who had acute renal colic with chills and subsequent high fever. There was no time to catheterize the ureters; just a chance to take an X-ray before operation. Nephrotomy was done and the upper portion of the ureter drained through the renal pelvis after a probe introduced from above had located the stone. A great many small abscesses were seen in the renal cortex; one or two were punctured and the pus cultured, and the colon bacillus was found. The fever quickly subsided. After some time the stone was removed from the ureter and the patient made a perfect recovery. These cases should certainly be treated as much as possible conservatively; here drainage without decapsulation sufficed to save the organ.

LATE RESULTS OF MIDGASTRIC (SLEEVE) RESECTION FOR HOURGLASS CONTRACTURE OF STOMACH. (TWO CASES.)

DR. WILLIAM A. DOWNES presented these cases. The first was a woman, forty-one years of age, who came to the hospital complaining of pain in the stomach after eating. This had been of seven years' duration, was sharp and cramping and came on about two hours after meals, being

worse at a point just above the navel, though sometimes spreading throughout the abdomen, especially in the right lower quadrant, and was relieved by taking food. She belched much gas and often vomited sour acid material, in which there was no blood. There was no blood in the stools nor were they ever black or tarry. She lost thirty-five pounds in the seven years. Examination showed the abdomen to be soft; no spasm or rigidity. There was definite tenderness in right upper quadrant at the lower angle near the umbilicus. Pulsation of abdominal aorta could be easily palpated. Operation was decided upon and on November 6, 1916, the abdomen was opened. On delivering the stomach into the abdominal wound the cicatrix of a gastric ulcer was seen in the anterior gastric wall near the middle of the lesser curvature; attached to this cicatrix was a small prolongation of the omentum. The site of the ulcer was quite indurated and the stomach wall around it, especially toward the cardiac end of the stomach, was rather œdematous and swollen. Long slender clamps were placed across the stomach, one above and one below the site of the ulcer; on the ulcer side of each clamp were placed two stout heavy clamps, each including about half the stomach wall to be resected; the stomach wall was divided just distal to the heavy clamps and the whole of the section of the stomach, including the gastric ulcer, was removed. The two ends of the divided stomach were then brought close together and sutured; the gastrohepatic omentum, which had been divided, was sutured to the remaining lesser curvature of the stomach; the divided gastrocolic omentum was sutured to the remaining greater curvature of the stomach. Interrupted sutures of fine silk reinforced all the sutures. The patient made an uninterrupted recovery and was discharged from the hospital fifteen days after operation. She is now well, has no pain or tenderness, has no nausea, vomiting or eructations. She eats five small meals a day and keeps the bowels open.

The second patient was also a woman aged forty-one years, who was admitted to the hospital December 30, 1917, complaining of gnawing pain under the ribs on the right side, which had lasted for fourteen days. It began after a light meal, and she also had heartburn. She vomited frothy fluid, and the stools were black. She had suffered similar attacks since childhood and had lost eighteen pounds in two years. The pain had no relation to meals, was aggravated by acid fruits and relieved by soda. Examination showed the abdomen to be slightly distended and there was slight tenderness and rigidity in epigastrium. The day following her admission to the hospital she was operated upon and the abdomen opened through a long right rectus incision. On the lesser curvature of the stomach, about two inches from the pyloric ring, there was a large puckered ulcer extending from the anterior surface of the stomach well to the posterior surface; the posterior part was adherent to the anterior surface of the pancreas. There were a great many adhesions in the omentum and in removing the ulcer a small portion of it remained adherent to the pancreas. There was no sign of perforation. Two long stomach clamps were placed, one proximally and one distally

to the ulcer site, through openings made in the gastrohepatic omentum and in the gastro-colic omentum small bayonet clamps were placed within the area of the stomach between the clamps and going to within about one inch of the pyloric ring and including the ulcer. It was then removed and the stomach walls were sutured, the first layer approximating the part in the posterior serosa and the posterior mucosa, and another layer was taken by means of Connel sutures closing the wall, including both the mucosa and serosa; then a reinforcing suture was taken entirely around the site with a continuous suture of 000 chromic including the serosa, then a few reinforcing sutures taken through the serosa of silk. The opening made in the peritoneal layers was closed, the stomach reduced into the abdomen, and the wound closed in the usual manner. The patient presented a good appearance and the stomach symptoms from which she had suffered were greatly improved.

Dr. George Woolsey said he had had a number of cases of sleeve resection, about nine in all. Three of them could not be followed, but his records showed that the other six did not have ultimate results as good as he had brought about with other forms of resection. They were, however, among the worst cases he had had of gastric ulcer. In five of them there were adhesions posteriorly, in three the pancreas formed the base of the ulcer, one had tuberculosis, three were heavy drinkers, and two had lues. There were good results in sixty-six per cent., that is, two-thirds of the cases. One of those that was classed as a poor result was a patient with lues who went along for two years and four months with very satisfactory results following operation. He then took to excessive drinking and relapsed. Another poor result was a poor risk from the first. Mesogastric resection has a place in surgery. In certain cases where about three inches of the pyloric end of the stomach is normal, with or without any hourglass contraction, it is an excellent operation. It is especially good in cases where the ulcer is posterior and adherent where excision is not easy or advisable.

Dr. Richard Lewisohn considered that the results of midgastric resection shown by Doctor Downes were certainly very good. The sleeve resection has been abandoned by most surgeons in favor of partial gastrectomy as the vast majority of these cases are not cured by a midgastric resection. The speaker had reëxamined lately four cases of sleeve resection performed by Dr. A. A. Berg, at Mount Sinai Hospital, four years ago. Three of these patients showed a residue after six hours. Sleeve resection is apt to cause hourglass formation of the stomach. Partial gastrectomy is quite as simple an operation and should be considered the method of choice in the majority of cases of penetrating ulcers of the lesser curvature of the stomach.

Dr. Nathan W. Green thought that this series, though very interesting, was more or less confusing to the physiologist because it is known that the innervation of the stomach is by the vagus nerves. The interference with the motor innervation of the stomach does not seem to be a very important thing as recounted in Doctor Downes' series.

Doctor Downes, in closing the discussion, replied to Doctor Lewisohn that the sleeve resection had not been done so often in recent years because these advanced cases with deformity were not so frequently seen as formerly. For ulcer, with hourglass deformity, situated near the middle of the stomach, it is wicked to remove two-thirds of the stomach when one can get a perfectly satisfactory result with this operation. The results shown this evening will substantiate that statement. If cases are properly selected, this should be considered a standard operation.

LARGE URETERAL STONE IN INFANT

Dr. Frederic W. Bancroft presented a child, who was admitted to the New York Hospital first on December 18, 1918. At that time it was two years of age. The complaint was then a right-sided hernia and frequency of urination. An X-ray was taken December 20, 1918, which showed no stone in the bladder. Urinalysis showed many pus-cells which were clumped.

The child was again admitted on December 17, 1919, with a history of frequent urination. At this time another X-ray was taken of both kidneys and the bladder, which was negative for calculus. Urine still contained pus.

The child was readmitted on November 22, 1921, and at this time X-ray showed that there was a large stone situated just beneath the crest of the symphysis. On December 5, 1921, he examined the child under a fluoroscope. The stone did not move when the child assumed a vertical or horizontal position. With a finger in the rectum and pressing down from above it was impossible to quite reach the lower border of the stone.

December 6th the child was anæsthetized and a small No. 9 cystoscope passed. There was a marked cystitis of the bladder and the bladder was found to be remarkably large. The light from the cystoscope transilluminated almost as high as the umbilicus. It was impossible with this small cystoscope to catheterize the ureters. No stone could be seen in the bladder.

Doctor Busby's report of the X-ray taken on December 2, 1921, was as follows: "Calculus in the pelvis posterior portion rather internal for right ureter and rather high for bladder. Possibly it is a stone in a bladder diverticulum or a fæcolith."

Physical examination of the child was negative, there being no tenderness or mass in the region of either kidney. The ante-operative diagnosis was difficult to make. We assumed that there was no stone free in the bladder and that, as it was so large with no history of renal pain. it seemed most probable that it was a stone forming in a diverticulum of the bladder.

Operation (December 8, 1921).—Right paramedian incision. Peritoneum opened high. Bladder was found much enlarged, extending almost to the umbilicus and particularly toward the right side. The stone was felt outside of the bladder and apparently in the ureter.

It was freely movable from the lower part of the pelvis to about two cm. up above the sacral prominence. The peritoneum was then closed. The peritoneum was retracted along the lateral wall, exposing the ureter and posterior portion of the bladder retroperitoneally. It was difficult to bring the stone up. It was finally grasped but could not be satisfactorily exposed, so that the bladder was opened. With finger in the bladder, it was easy to bring up the ureter. Longitudinal incision was made in the ureter and a stone about four by one and five-tenths cm. removed. Finger was inserted in the ureter; it was enlarged about two cm. in diameter from just above the bladder to about three cm. above the crest of the sacrum. Beyond this a vertebrated probe could be easily passed to the kidney pelvis. Distally, vertebrated probe descended to the region of the trigone but not into the bladder. The kidney was palpated. It showed a rather marked hydronephrosis. The kidney, however, was not enlarged. The wound in the ureter was closed with a double Lembert suture, and the incision in the bladder was closed in a similar manner. Through a stab wound near the anterior superior spine, a dressed tube was inserted. Abdominal wound then closed in layers without drainage.

Post-operative Course.—There was no leakage of urine and median incision healed by primary union. Stab wound was closed within ten days. Child is now up and about and apparently in good condition.

The question naturally arises whether this stone could have been present two years ago when the X-rays were negative or whether such a large stone could form in such a short time. Analysis of the stone shows it to be a calcium phosphate stone. There is slightly more calcium on the peripheral portion than in the central portion of the stone. This, of course, might mean that in the earlier period, the stone being small in diameter and of less calcium content, it might not have shown in the X-ray, while as its diameter increased in size and the calcium content increased, the shadow became very evident as shown in the X-ray.

TRAUMATIC SUB-DURAL PNEUMATOCELE WITH AIR IN THE VENTRICLES

Dr. Nathan W. Green reported the case of a man, age forty-five years, who was admitted to the City Hospital, service of Doctor Green, on Saturday, October 29, 1921, with a history of intoxication and having been struck on the forehead. He was unconscious and had a laceration of the forehead. His blood-pressure was 116/170, pulse 84, respiration 24, temperature 97, on admission; and his spinal tap showed a normal flow which was somewhat blood-tinged. The diagnosis on admission was laceration of forehead and fracture of the skull. He was given urotropin gr. vii as soon as admitted and this was continued until December 1, 1921. On Sunday, which was the following day, he regained consciousness and the X-ray was allowed to wait, as there were no focal symptoms of brain injury. He was kept in bed five days and during that time had continuous headache. When he got up and tried to walk he felt dizzy and began to sweat profusely. He also vomited. No fluid

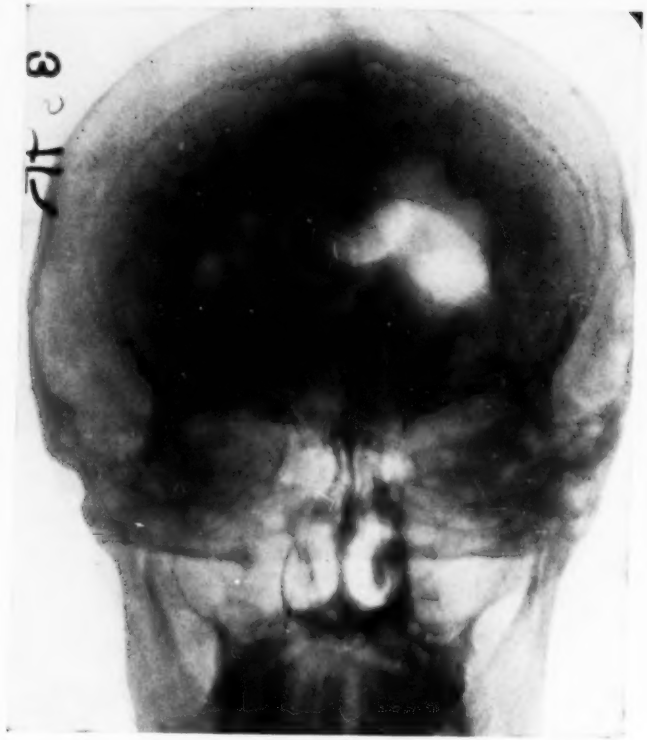

FIG. 1.—Picture 20 days after injury showing air in left ventricle with a smaller amount in right ventricle.

FIG. 2.—Diagonal view of head. (The plate has been reversed in printing.)

FIG. 3.—Picture twenty-four days after injury. Showing air in left ventricle with a smaller accumulation in right ventricle. Amount of air seems to be greater than in Fig. 1.

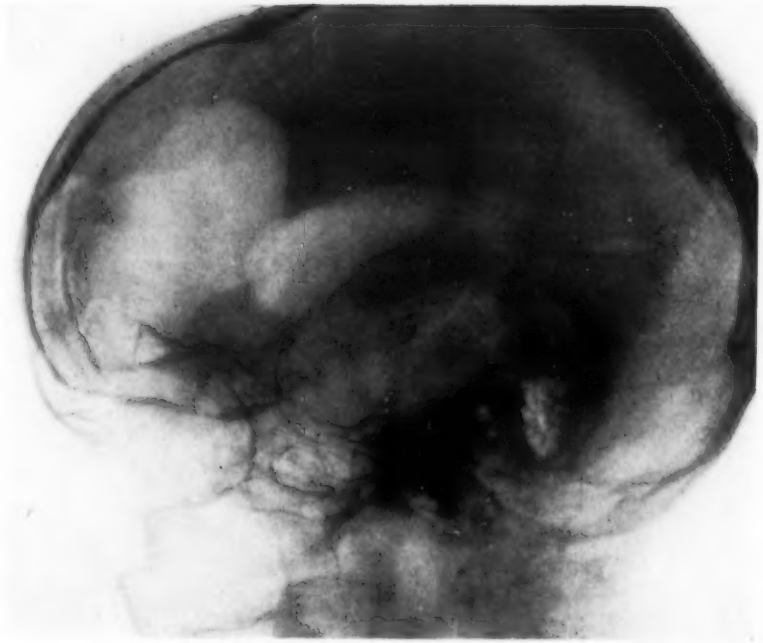

FIG. 4.—Lateral view showing sub-dural air, and ventricle outlined by air.

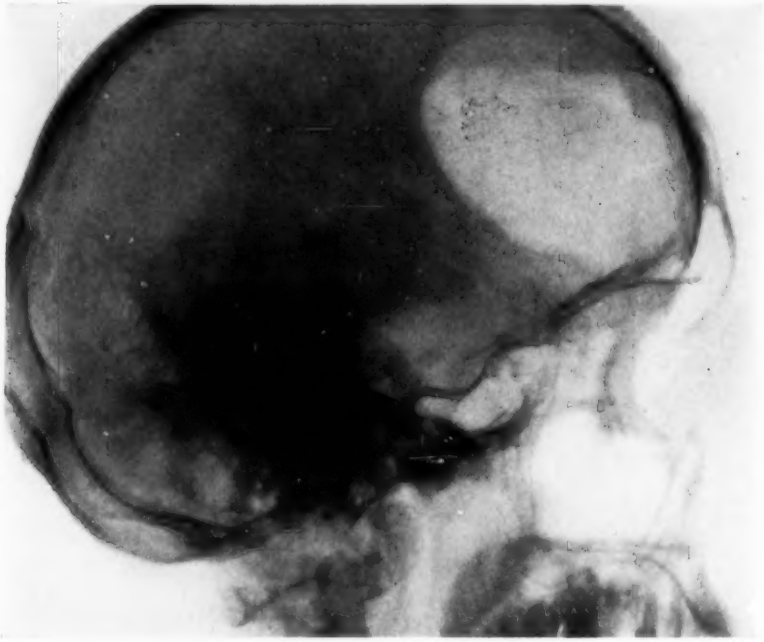

FIG. 5.—Shows accumulation of air. Trephine defect. Fracture. (Four days after operation.)

FIG. 6.—Shows fracture of frontal bone, A. Trephine opening, B. It shows also that the air has been absorbed. Picture taken January 9, 1922, nearly two and one-half months after injury; and six weeks after operation. (The plate has been reversed in printing.)

ran out of his nose as yet. The symptoms led to an X-ray and a shadow, which was so conspicuous that it was thought to be an artifact, was found (Fig. 1). To exclude the possibility of an artifact another picture was taken to show the diagonal diameter of the head (Fig. 2). Then another picture duplicating the first one showed the same shadow.

A note by Dr. J. H. Larkin, on November 3, 1921, reported the colloidal gold test for spinal fluid negative.

Another note by Doctor Larkin, on November 7, 1921, showed the blood for Wassermann negative.

A note by Doctor Pardee, on November 11, 1921, gave a diagnosis of cerebral concussion.

A note on November 18th, by Dr. A. P. Evans, the röntgenologist to whom he was indebted for this picture, reported the left ventricle as showing an air accumulation with a small accumulation in the right one; and on the surface of the anterior left frontal lobe a large air accumulation. A linear fracture of the left frontal eminence was described. This condition is well shown by Figs. 3 and 4. A note by Dr. N. W. Green, on November 21st, said that the patient was mentally about the same as since regaining consciousness, but that his general appearance was worse. The possibility of a low-grade infection with gas production was considered.

On November 25, 1921, after talking the case over with Dr. Alfred S. Taylor, an operation was performed under novocaine by Doctor Green. The frontal bone was opened with a small trephine over the point of air accumulation, as shown by the X-ray, and an exploratory needle inserted through the dura. Air was withdrawn which was odorless. The needle was then inserted further (about ten cm.) and cerebrospinal fluid withdrawn. The needle was then partly withdrawn again and saline solution introduced (about two ounces in amount). When about half-way through this procedure the patient began to cough and said water was running down his throat. This was the saline which had been introduced into the dura—demonstrating a direct connection between the dural cavity and the accessory sinuses. The hope was to fill this cavity with saline while letting out the air with another needle. But after repeated trials this was given up. The wound was then closed by suture. Time of operation fifty-five minutes. Pulse before the operation was sixty. After the operation ninety-five. Fluid kept running out of his nose for some time—about four weeks after the operation.

A note by Doctor Strouse on November 28, 1921, reported the eye grounds as negative.

On December 9, 1921, the wound of operation was entirely healed and the patient was complaining of nothing.

A note by Dr. Howard D. Collins, on December 15, 1921, on whose service the patient then was, described the patient as complaining of dizziness, but Doctor Hunt advised no further interference.

Doctor Navas noted that on December 23, 1921, succussion was present in the head. This was also noted by Doctor Schwartz on December

25th, and a further note said that the patient seemed unduly cheerful (a possible frontal involvement). The patient got up after the first of the New Year and was allowed full freedom of the ward. About January 29, 1922, he contracted a coryza, but went through it without mishap. He is now as well as formerly and he has no headaches.

DOCTOR GREEN's interpretation of the case is that there was a fracture of the cribriform plate and through that the air entered the dura. One of the X-rays showed a slight faulting here. The fracture of the frontal bone is quite obvious. He was indebted to the men mentioned in this report for their extreme courtesy and helpfulness in working up this case.

DR. CHARLES A. ELSBERG recalled seeing a case of this kind a year ago. The patient had air in the cranial cavity and in the ventricle, about as much as in the films Doctor Green showed. There were no symptoms after injury except some local swelling. The claim has been made that air may get into the ventricles through the floor of the third ventricle.

OUTCOME OF THE STAPHYLOCOCCUS INFECTIONS OF THE FACE AND LIPS

DR. WALTON MARTIN read a paper with the above title.

DR. WILLY MEYER considered that although there was some truth in the statement that some of these cases can be treated too early by operation, personally, he believed with Doctor Martin that if these cases were seen early an important step in saving the patient was gained. With an advanced sinus or deep jugular phlebitis naturally little could be done. In all the cases he had treated since 1895 he at once employed Bier's hyperæmic treatment, placing an elastic band around the neck. Again and again he could demonstrate the great value of this procedure in the early treatment of boils and carbuncles of the face and neck. The elastic band is applied around the neck immediately above the clavicles, but not too tightly; it must be comfortable for the patient to breathe, swallow, speak, etc. First it is kept on continuously for twenty-four hours, then it is removed for one hour of each twelve hours, If the œdema is not too pronounced the band can be left in place for forty-eight hours. As soon as the pus pustule forms at the top of the infiltration surgery steps in while typical hyperæmic treatment is continued. Many more of these patients die than recover if they are operated upon too early.

DR. CHARLES H. PECK agreed thoroughly with the principle of "hands off" treatment in most of these cases in the early stage. He had seen within the month an example of this sort of furuncle of the right nostril which for a week had been subjected to several incisions. He saw the patient in the afternoon; in the morning he had had complete loss of sight in the right eye and the temperature had been 103°. At five P.M. the temperature was 105.8° and he was quite delirious, with congestion of the upper part of the face and forehead, and he died in twenty-four hours of the onset of these symptoms from septic thrombosis of the sinuses. The original furuncle was not very extensive. This was the only fatal case Doctor Peck had seen;

he had not seen any of the severe types Doctor Martin spoke of, but he believed non-surgical treatment in the early stages was what he should select.

Dr. John Douglas said there are many cases of furuncle of the nostril but they do not seem to be quite the same virulent type as those furuncles of the skin of the lip. Perhaps they are not so easily traumatized. Whether the seriousness of these lesions is due to a difference in virulence or in the resistance, it is difficult to say, but trauma certainly affects their course adversely. It is a curious coincidence, that two cases they had at St. Luke's occurred in two sisters, the infections occurring one year apart; both ran the same sort of a severe course and one died as a result of her infection. One patient, a man seen outside the hospital, had a small furuncle of the lip which he had picked with a scarf pin. He died of hæmiplegia. At autopsy they found rupture of one of the cerebral vessels with an area of meningitis and a softened area in the brain. The cellulitis had spread over the side of the face, but no pus had developed in this area at any time and the infection, as usually occurs in these cases, had spread along the vessels rather than by the lymphatics.

Dr. Fordyce B. St. John related the case of a young woman of twenty-two years of age, who was admitted to the Presbyterian Hospital within the last five weeks, having been treated for a carbuncle, which completely involved the upper as well as the lower lip. She had a temperature of 104°, pulse of 120, and blood test positive to staphylococcus hæmolyticus on two examinations, separated by an interval of five days. She had been treated by a local physician for two weeks. She was taken to the operating room and multiple incisions made. The pathological picture found was that which Doctor Martin described. For over a period of fifteen years she had been subject to boils, presumably staphylococcus aureus infections. There was apprehension as to the prognosis, but eventually the lesion cleared up and the patient got well. The speaker cited this case because of the extent of the lesion and the possibility of a cumulative resistance to staphylococcus aureus acquired over a long period of time.

Dr. DeWitt Stetten spoke of several of these fatal cases that he had seen at the Lenox Hill Hospital, a few of which were reported by Doctor Bullock some years ago. Although he did not recall the autopsy records in these cases he was under the impression that they showed a multiple pathology. He did not believe that death in these cases is always due to the same pathological condition. In some cases a cavernous sinus thrombosis from direct venous extension may be found, in others a bacteriæmia may be the cause of death. A third cause is a meningitis of purely lymphatic origin. He saw such a case last year. The patient was a moribund child who had had an insignificant furuncle of the ala nasi which had not been operated on and which had practically healed. The child had a staphylococcic meningitis demonstrated by lumbar puncture. The speaker was in agreement as to the conservative treatment of these furuncles, and advised strongly against

the use of local anæsthesia, as infiltration into the infected area in this locality is a particularly dangerous procedure.

Dr. Allen O. Whipple inquired if Doctor Martin had found associated with these cases a condition resembling erysipelas. The patient Doctor St. John referred to had a condition of the skin which, aside from the carbuncle, resembled erysipelas and which subsided under cold applications to the parts. This was the third case he had seen with this associated condition.

Dr. William A. Downes remembered seeing two of the cases on Doctor Martin's list, one a private patient who came to him four or five days after an incision in the nose and in forty-eight hours had marked bulging of both eyes and died of sinus thrombosis. That patient had been for a long time in the habit of plucking the hairs from his nose. The other patient went to the dispensary of St. Luke's and had a small furuncle on his upper lip opened. When he was brought into the wards a few days later, both eyes were bulging, and he died twenty-four hours afterward. As to the treatment, the thing to do is to leave these patients alone, except to apply hot water until the lesion points.

Doctor Martin, in closing the discussion, replied first to Doctor Whipple that none of the patients on his list had presented any features resembling erysipelas. In regard to the warning by Doctor Stetten as to the use of local anæsthesia, the speaker agreed with him. As to the treatment by hyperæmia mentioned by Doctor Meyer, Doctor Martin said he had referred to a paper published on that subject and had given Lexer's criticism; personally he had had no experience with it. In closing, he wished to express his thanks to the members of the Attending Staff at St. Luke's for their kindness in permitting him to use their case reports.

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INDEX TO VOLUME LXXV

A

Abdomen, Foreign Body in the, 737.

Abdominal Incision, The Transverse, 70.

Abdominal Membranes, Anomalous, their Influence upon the Digestive Tract, 513 and 753.

Abscesses, Tuberculous, of the Chest Wall, 404.

Adrenal Gland, Effect of Extirpation upon Epilepsy, 248.

ALTER, NICHOLAS M.: Carcinomatous Papilloma of the Renal Pelvis, 605.

Anæmia, Pernicious, Splenectomy for, 121; Surgical Treatment of, 31.

Anastomosis, Hepatic, Jejunal, for Destruction of Common Duct, 629.

Aneurism, Extracranial, of the Internal Carotid Artery, 688.

Ankle-joint Involved in Fractures of the Tibia, 243.

Ankylosis, Cicatricial, of the Jaw, 503; Osteophytic, of Elbow, 638.

Anthrax Septicæmia, Serum Treatment of, 663.

Appendicitis Complicated by Acute Pyelonephritis, 758.

ASCHNER, PAUL W.: The Pathology of Lung Suppuration, 321.

ASHURST, ASTLEY P. C.: Cystic Diseases of Bone Tumors, 506; Double Fractures Involving Ankle-joint, 243; End Results of Operation for Dupuytren's Contracture, 505.

AUCHINCLOSS, HUGH: Tuberculous Abscesses of the Chest Wall, 404.

Avulsion of Palm, 744.

Axillary Lymphosarcoma, Primary, in a Child, 509.

AYERS, CHARLES E.: The Use of Fascia Lata to Repair Defect of Heel, 252.

BAKER, JAMES NORMENT: Hernia of the Bladder, 615.

BALDWIN, JAMES H.: Foreign Body in the Rectum, 741; Hydrops of Gall-bladder, 741.

Hydrops of Gall-bladder, 741.

B

BANCROFT, FREDERIC W.: Large Ureteral Stone in Infant, 763.

BARBER, WM. H.: Acute Perforated Ulcer of the Stomach or Duodenum, 349.

BEER, EDWIN: Distinction Between Colon and Coccic Infections of the Kidneys, 760; Exfoliation of the Interior of the Bladder After Use of Mercurochrome, 757.

Bile Ducts, Hepaticoduodenostomy for Injury of the, 344.

Bile Duct, Common, Reconstruction of, 378.

Biliary Fistula, External, 506.

Biliary Tract, Surgery of the, 196.

BIZARRO, A. H.: Comparative Analysis of 213 Forearm and Leg Fractures, 221.

Bladder, Exfoliation of the Interior of the, Following the Use of Mercurochrome, 757; Exstrophy of, The Potential Malignancy in, 365; Hernia of the, 615.

BLAKE, JOSEPH A.: Drainage, 385.

Blood-pressure, Value of, in Acute Cerebral Compression, 732.

Blood-vessels, the Deep-seated, The Surgical Exposure of the, by J. FIOLLE and J. DELMAS, translated by CHARLES G. CUMSTON, Review of, 127.

Bone Transplantation for Tibial Cyst, 756.

Bone Tumors, Cystic Diseases of Bone and, 506.

BORDEN, DANIEL L.: Diaphragmatic Hernia, 337.

Brain Tumor, 376.

Branchial Fistula, 119.

Breast Cancer, Life Expectancy Following Radical Amputation for, 61; Unusual Result of X-ray Radiation Upon, 117; Male, Papillary Cystadenoma of the, 652.

Breast, Tumors of the, Benign and Malignant, 631, 641.

BRODERS, ALBERT C.: Epithelioma of the Genito-urinary Organs, 574.

BROMER, RALPH S.: Cystic Diseases of Bone and Bone Tumors, 506.

Bronchoscopic Extraction of Foreign Bodies from the Lungs and Œsophagus, 1.

BROWN, HENRY P.: Hernia of Female Reproductive Organs into the Inguinal Canal, 742.

BROWN, ARTHUR E.: Post-operative Tetany with Implantation of Human Parathyroids, 418.

Bubis, J. L.: Gas Cysts of the Intestines, 620.
Burrell, N. E.: Cystic Dilatation of the Common Bile Duct, 191.
Bütler, William J.: Peritonitis as a Complication of Prostatectomy, 668.

C

Caldwell, John A.: Spiral Fracture of the Tibia and Fibula, 717.
Cancer of the Breast, 641; of the Cardiac End of the Stomach, Relative Merits of Gastrostomy and Jejunostomy in the Treatment of, 746; The Relationship of Massage to Metastasis in, 129.
Carcinoma of Transverse Colon, Resected, 636.
Capsulorrhaphy for Persistent Subglenoid Dislocation of Shoulder, 749.
Carbon Arc Lamp, The Treatment of Surgical Tuberculosis with the, 400.
Carcinomatous Papilloma of the Renal Pelvis, 242, 605.
Carotid Artery, Internal, Extracranial Aneurism of the, 688.
Cerebellum, Cyst of the, 376.
Cerebral Compression, Value of Blood-pressure in, 732.
Cervical Rib Syndrome and Posture, 105.
Chest Wall, Tuberculous Abscesses of the, 404.
Chinosol and Sodium Chloride, Treatment of Erysipelas with, 143.
Cohen, Ira: Dislocation of the Pisiform Bone, 238.
Coley, William B.: Traumatic and Industrial Hernia, 467.
Colon, Carcinoma of, Transverse, Carcinoma of, 636.
Cooperman, M. B.: Von Recklinghausen's Disease, 171.
Cranial Defect, 243.
Cranioplasty for Large Temporal Defect, 113.
Crile, George W.: Special Points in the Technic of Operations on the Thyroid Gland, 47.
Cyst of the Popliteal Space, 246.
Cystadenoma, Papillary, of the Male Breast, 652.
Cystic Dilatation of the Common Bile Duct, 191.
Cystic Diseases of Bone and Bone Tumors, 506.
Cystic Duct, High Ligation of the, in Cholecystectomy, 241; Results of High Ligation of the, in Cholecystectomy, 203.
Cysts, Gas, of the Intestines, 620.

D

Dakin's Solution in the Treatment of Osteomyelitis, The Value of, 708.
David, Vernon C.: Papillary Cystadenoma of the Male Breast, 652.
Dean, S. C.: Gunshot Wound of External Iliac Artery, 253.
Delmas, J.: The Surgical Exposure of the Deep-seated Blood-vessels, Review of, 127.
De Vecchi, Paolo: Modern Italian Surgery and Old Universities of Italy, Review of, 127.
Diaphragmatic Hernia, 337, 620.
Dislocation of the Pisiform Bone, 238.
Dorrance, G. M.: Avulsion of Palm, 744; Skin Tension Buttons, 745; Tuberculosis of Elbow Cured by X-ray, 744.
Douglas, John: Reconstruction of Common Bile Duct, 379; Results of the Staphylococcus Infections of the Face and Lips, 767.
Dowd, Charles N.: Malignant Tumors of the Breast, 631.
Downes, William A.: Anomalous Abdominal Membranes, 753; Anomalous Abdominal Membrane, 758; Jejunostomy in Ulcer of the Lesser Curvature and Posterior Wall of the Stomach, 747; Late Results of Midgastric Resection for Hour-glass Contracture of Stomach, 760; Staphylococcus Infections of the Face and Lips, 768.
Drainage, 385.
Duodenectomy, 208.
Duodenum, Bleeding Ulcer of the, with Cholecystitis, 459.
Dupuytren's Contracture, End Results of Operation for, 504.

E

Eggers, Carl: Appendicitis Complicated by Acute Pyelonephritis, 758; Non-rotation of the Large Intestine, 757.
Elbow, Osteophytic Ankylosis of, 638; Tuberculosis of the, Cured by X-ray, 744.

ELIOT, ELLSWORTH, JR.: Appendix to the Left of the Umbilicus, 758.
ELLIS, J. W.: The Cause of Death in High Intestinal Obstruction, 429.
ELSBERG, CHARLES A.: Cranioplasty for Cranial Defects, 115; Brain Tumor, 376; Cyst of the Cerebellum, 376; Recurrent Spinal Cord Tumor, 377; Spinal Symptoms Relieved by Laminectomy, 377; Spinal Cord Tumor, 378.
Epilepsy, Effect of Extirpation of Adrenal Gland upon, 248.
Epiphysis, Premature Ossification after Separation of the Lower Radial, 501.
Epiplopexy, The Present Status of, 449.
Epithelioma of the Genito-urinary Organs, 574; of the Salivary Gland Type, Aberrant Adenoid Cystic, 331.
ERDMAN, SEWARD: Reconstruction of the Common Bile Duct, 381; Branchial Fistula, 120.
ERDMANN, JOHN F.: Reconstruction of Common Bile Duct, 380.
Erysipelas, Treatment of, with Chinosol, 143.
Exstrophy of the Bladder, The Potential Malignancy in, 365.

F

Face and Lips, Staphylococcus Infections of the, 766.
Fascia Lata, The Use of, to Repair Defected Heel, 252.
Femoral Artery and Vein, Bullet Wound of, Successfully Treated, 705.
Femoral Hernia, Intra-abdominal Operation for, 110.
FIOLLE, J.: The Surgical Exposure of the Deep-seated Blood-vessels, Review of, 127.
FISCHER, HERMANN: Effect of Extirpation of Adrenal Gland upon Epilepsy, 248; Longitudinal Section of Patella for Removal of Joint-Mouse, 751.
Fistula, Branchial, 119; External Biliary, 506.
FLETCHER, L. Z.: Ruptured Spleen, 186
FLICK, JOHN B.: The Present Status of Epiplopexy, 449.
Forearm and Leg Fractures, Comparative Analysis of 213 Cases, 221.
Foreign Bodies, Bronchoscopic Extraction of, from the Lungs and Œsophagus, 1.
Foreign Body in the Abdomen, 737; in Rectum, 741.
Fracture, Compound, Wound Incision in the Treatment of, 38; of the Metatarsal Bones, Bloodless Reductions, 124; of the Tibia and Fibula, Spiral, 717; of Tibia Involving Ankle-joint, 243.
Fractures of the Forearm and Leg, Comparative Analysis of 213 Cases, 221.
Gall-bladder, Hydrops of the, 741.

G

Gas Gangrene in Civil Life, 240.
Gastrectomy, Partial, for Penetrating Ulcers of the Stomach, 247.
Gastro-enterostomy Stoma, Stenosis of, 627.
GATCH, W. D.: Neuro-fibro-myxoma, Treated by Conservative Operation, 181.
Genito-urinary Organs, Epithelioma of the, 574.
GEORGE, ARIAL W.: The Pathological Gall-bladder, 640.
GIBBON, JOHN H.: The Present Status of Epiplopexy, 449.
GIBSON, CHARLES L.: Hepatic Jejunal Anastomosis for Destruction of Common Duct, 629; Plastic on Hand, 630.
GILL, ARTHUR BRUCE: End Results of Operation for Dupuytren's Contracture, 504.
GRAVES, ROGER COLGATE: Shadowless Renal Calculi, 487.
GREEN, NATHAN W.: Acute Hæmatogenous Infection of the Kidney, 760; Anomalous Abdominal Membranes, 753; Pulmonary Lobectomy, 384; Relative Merits of Gastrostomy and Jejunostomy in Cancer of the Cardiac End of the Stomach, 746; Traumatic Subdural Pneumatocele, 764.
Gunshot Wound of External Iliac Artery, 253; of Horse-shoe Kidney, 253.

H

HALSTED, WILLIAM STEWART: Blind-end Circular Suture of the, 356.
Hand, Plastic on, 630.
HARTMANN, FRED L.: Gas Gangrene in Civil Life, 240; High Ligation of the Cystic Duct in Cholecystectomy, 241; Results of High Ligation of the Cystic Duct in Cholecystectomy, 203.

HAYS, GEORGE LIVINGSTON: Volvulus of the Sigmoid, 724.
Heel, Defect of, Use of Fascia Lata to Repair, 252.
HELLER, E. P.: Rectal and Vesical Incontinence Relieved by Operation, 89.
Hepatic Jejunal Anastomosis for Destruction of Common Duct, 629.
Hepaticoduodenostomy for Injury of the Bile Ducts, 344.
Hernia, Diaphragmatic, 337; Femoral, Intra-abdominal Operation for, 110; of Female Reproductive Organs into the Inguinal Canal, 742; of the Bladder, 615; Sciatic, 672; Spontaneous Lateral Ventral, 677; Traumatic and Industrial, 467; Traumatic Diaphragmatic, 620; Umbilical and Inguino-labial, 638.
HERRICK, W. W.: Anomalous Abdominal Membranes, 754.
Hip, Disarticulation of the, 736.
HITZROT, JAMES MORLEY: Pulmonary Lobectomy, 382; Splenectomy for Pernicious Anæmia, 121; Surgical Treatment of Pernicious Anæmia, 31.
HOGUET, J. P.: Anomalous Abdominal Membranes, 754; Cranioplasty for Large Temporal Defect, 115.
HOLLOWAY, JACKSON K.: Spontaneous Lateral Ventral Hernia, 677.
Horse-shoe Kidney, Gunshot Wound of, 253.
Hour-glass Contracture of Stomach, Late Results of Midgastric Resection for, 760.
HUTCHISON, J. A.: Traumatic and Industrial Hernia, 467.
Hydronephrosis, Intermittent, with Gastro-enterologic Symptoms, 372.

I

Ileus, Acute, Lethal Factors in, 423.
Iliac Artery, External, Gunshot Wound of, 254.
Incontinence, Rectal and Vesical, Relieved by Operation, 89.
Infant, Large Ureteral Stone in, 763.
Inguino-labial and Umbilical Hernia, 638.
Intestinal Obstruction, 81; The Cause of Death in High, 429.
Intestine, Blind-end Circular Suture of the, 356; Non-rotation of the Large, 757.
Intestines, Gas Cysts of the, 620; Intra-abdominal Hemorrhage from Ruptured Corpus Luteum, 492.
Intussusception, Recurrent Double, Due to Multiple Fibromata of the Ileum, 738.
Italian Surgery of the Old Universities of Italy by, Paolo De Vecchi, Review of, 127.
IVY, ROBERT H.: Cicatricial Ankylosis of the Jaw, 503; Regeneration of Lower Jaw, 503.

J

JACKSON, CHEVALIER: Bronchoscopic Extraction of Foreign Bodies from the Lungs and Œsophagus, 1.
Jaw, Cicatricial Ankylosis of the, 503; Lower, Regeneration of, 503.
Jejunal, Hepatic, Anastomosis for Destruction of Common Duct, 629.
Jejunostomy of the Lesser Curvature and Posterior Wall of the Stomach, 747.
JOHNSON, FREDERICK M.: Aberrant Adenoid Cystic Epitheliomas of the Salivary Gland Type, 331.
JONES, WALTER M.: War Injuries Coming to Subsequent Operation, 389.
JOPSON, JOHN H.: Cicatricial Ankylosis of the Jaw, 503; External Biliary Fistula, 506; Hernia of the Uterus, 743.
JUDD, EDWARD STARR: Bleeding Ulcer of the Duodenum with Cholecystitis, 459.

K

KAWAMURA, KYOICHI: Duodenectomy, 208.
KEENAN, C. B.: Traumatic Diaphragmatic Hernia, 620.
KESSEL, GEORGE: Osteophytic Ankylosis of Elbow, 638.
Kidney, Hæmatogenous Infection of the, 759; Horse-shoe, Gunshot Wound of, 253; Infections, Non-tubercular, 478.
KING, JOSEPH E. J.: Cranioplasty for Cranial Defects, 115.
Knee-joint in Intercondyloid Notch, Longitudinal Section of Patella for, 750.
KNOX, LEILA CHARLTON: The Relationship of Massage to Metastasis in Malignant Tumors, 129.

L

LANDON, LYNDON HOLT: Carcinomatous Papilloma of the Renal Pelvis, 605.
LA ROQUE, G. PAUL: Bullet Wound of the Femoral Artery and Vein Successfully Treated, 705; Intra-abdominal Operation for Femoral Hernia, 110.

LEE, BURTON J.: Unusual Result of X-ray Radiation upon Breast Cancer, 117.
LEE, WALTER ESTELL: Recurrent Double Intussusception Due to Multiple Fibromata of the Ileum, 738.
Leg and Forearm Fractures, Comparative Analysis of 213 Cases, 221; Spiral Fracture of the, 717.
LEIGH, SOUTHGATE: Traumatic and Industrial Hernia, 467.
LEONARD, RALPH D.: The Pathological Gall-bladder, 640.
LEWISOHN, RICHARD: Partial Gastrectomy for Penetrating Ulcers of the Stomach, 247; Results of Midgastric Resection for Hour-glass Contracture of Stomach, 762; Stenosis of Gastro-enterostomy Stoma, 627; Transfusion in Pernicious Anæmia, 123.
LILIENTHAL, HOWARD: Branchial Fistula, 119; Resection of the Lung for Suppurative Infections, 257; Transfusion in Pernicious Anæmia, 121.
LOWER, WILLIAM E.: Special Points in the Technic of Operations on the Thyroid Gland, 47.
Lung-Suppuration, The Pathology of, 321.
Lung-Resection for Suppurative Infections, 257, 382.
Lungs and Œsophagus, Bronchoscopic Extraction of Foreign Bodies from the, 1.
LUSK, WILLIAM C.: The Treatment of Erysipelas with Chinosol and Sodium Chloride, 143.
Luteum, Corpus, Intra-abdominal Hemorrhage from Ruptured, 492.
Lymphosarcoma, 507; Primary Axillary, in a Child, 509.

M

MACCARTY, WM. C.: Life Expectancy following Radical Amputation for Carcinoma of the Breast, 61.
MCDOWELL, EPHRAIM: Biography, by August Schachner, Review of, 125.
MCEACHERN, J. D.: Hepaticoduodenostomy for Injury of the Bile Ducts, 344.
MCGLANNAN, ALEXIUS: Intermittent Hydronephrosis with Gastro-enterologic Symptoms, 372.
MCWILLIAMS, CLARENCE A.: Cancer of the Breast, 635.
Male Breast, Papillary Cystadenoma of the, 652.
MALONE, JULIAN Y.: Value of Blood-pressure in Acute Cerebral Compression, 732.
MANN, FRANK C.: Duodenectomy, 208.
MARTIN, WALTON: Anomalous Abdominal Membranes, 753; Relative Merits of Jejunostomy and Gastrostomy in Ulcer of the Stomach, 748; Results of the Staphylococcus Infections of the Face and Lips, 768.
Massage, The Relationship of, to Metastasis in Malignant Tumors, 129.
MATHEWS, FRANK S.: Branchial Fistula, 120; Reconstruction of Common Bile Duct, 378.
Mediastinum, Notes on Surgery of the, 53.
Membranes, Anomalous Abdominal, their Influence upon the Digestive Tract, 513, 753.
Metastasis in Malignant Tumors, The Relationship of Massage to, 129.
Metatarsal Bones, Fracture of the, Bloodless Reductions, 124.
METCALFE, R. F.: Ruptured Spleen, 186.
MEYER, WILLY: Acute Hæmatogenous Infection of the Kidney, 760; Outcome of the Staphylococcus Infections of the Face and Lips, 766; Pulmonary Lobectomy, 382.
MITCHELL, C. F.: Foreign Body in the Abdomen, 737.
MOORE, EDWARD C.: Intra-abdominal Hemorrhage from Ruptured Corpus Luteum, 492.
MOORE, WILLIAM J.: Transverse Abdominal Incision, 70.
MORRIS, ROBERT T.: Musculospiral Nerve Repair, 628.
MOSCHCOWITZ, ALEXIS V.: Complete Cast of the Stomach Due to Burn, 756; Tumors of the Breast, 632.
Musculospiral Nerve Repair, 628.

N

Neuro-fibroma-myxoma, Treated by Conservative Operation, 181.
New York Surgical Society, Transactions of the, 113, 246, 376, 627, 746, 756.
Non-tubercular Kidney Infections, 478.

O

Obstruction of the Bowels, Acute, 81.
O'CONOR, JOHN: Acute Intestinal Obstruction, 81.

Osteitis Fibrosa, 171.
Osteophytic Ankylosis of Elbow, 638.
Osteomyelitis, The Value of Dakin's Solution in the Treatment of, 708.
Owen, Hubley R.: Thyroid Toxæmia, 740.

P

Palm, Avulsion of, 744.
Papilloma, Carcinomatous, of the Renal Pelvis, 605.
Parathyroids, Post-operative Tetany with Implantation of Human, 418.
Parce, A. D.: Improved Method of Skin Grafting, 658.
Patella, Longitudinal Section of, for Joint Mouse, 750.
Pathological Gall-bladder, by Arial W. George and Ralph D. Leonard, 640.
Peabody, Charles W.: Secondary Foci of Tuberculosis in Potts' Disease, 95.
Peck, Charles H.: Acute Hæmatogenous Infection of the Kidney, 759; Results of the Staphylococcus Infections of the Face and Lips, 766; Tumors of the Breast, 631; Tumors of the Breast, 641.
Peritonitis as a Complication of Prostatectomy, 668.
Pernicious Anæmia, Splenectomy for, 121; the Surgical Treatment of, 31.
Philadelphia Academy of Surgery, Transactions of the, 240, 503, 736.
Pisiform Bone, Dislocation of the, 238.
Plastic on Hand, 630.
Pneumatocele, Subdural, Traumatic, 764.
Pool, Eugene H.: Anomalous Abdominal Membranes, 753; Hepatic Jejunal Anastomosis for Destruction of Common Duct, 630.
Popliteal Space, Cyst of the, 246.
Potts' Disease, Secondary Foci of Tuberculosis in the Spine in, 95.
Prostatectomy Complicated by Peritonitis, 668.

R

Rectal and Vesical Incontinence Relieved by Operation, 89.
Rectum, Foreign Body in the, 741.
Reel, P. J.: Cystic Dilatation of the Common Bile Duct, 191.
Renal Calculi, Shadowless, 487.
Renal Pelvis, Carcinomatous Papilloma of the, 242, 605.
Reproductive Organs, Female, Hernia of, into the Inguinal Canal, 742.
Ritchey, W. D.: Neuro-fibro-myxoma, Treated by Conservative Operation, 181.
Rodman, J. S.: Cases of Cranial Defect, 243.
Russel, James I.: Relative Merits of Jejunostomy and Gastrostomy in Ulcer of the Stomach, 748.

S

St. John, Fordyce B.: Carbuncle of the Face, 767.
Salivary Gland Type, Epitheliomas of the, Aberrant Adenoid Cystic, 331.
Sauer, Paul Kurt: Treatment of Surgical Tuberculosis with the Carbon Arc Lamp, 400.
Schachner, August: Biography and Review of Ephraim McDowell, 125.
Schley, Winfield Scott: The Low Transverse Incision in Operations upon the Thyroid Gland, 686.
Scholl, Albert J.: The Potential Malignancy in Exstrophy of the Bladder, 365.
Schwyzer, Arnold: Notes on Surgery of the Mediastinum, 53.
Sciatica, Hernia, 672.
Sehrt's Tourniquet, Paralysis Following Use of, 256.
Serum Treatment of Anthrax Septicæmia, 663.
Sheldon, J. G.: Rectal and Vesical Incontinence Relieved by Operation, 89.
Shoulder, Persistent Subglenoid Dislocation, Treated by Capsulorrhaphy, 749.
Sigmoid, Volvulus of the, 724.
Sistrunk, W. E.: Life Expectancy following Radical Amputation for Carcinoma of the Breast, 61.
Skillern, P. G., Jr.: Fracture of the Metatarsal Bones, Bloodless Reductions, 124.
Skin Grafting, Improved Method of, 658.
Skin Tension Buttons, 745.
Smith, Morris K.: Premature Ossification after Separation of the Lower Radial Epiphysis, 501.
Smyth, C. M., Jr.: Results of High Ligation of the Cystic Duct in Cholecystectomy, 203.
Speese, John: External Biliary Fistula, 506.
Spinal Cord Tumors, 377, 378.

Spine, Secondary Foci of Tuberculosis in the, 95.
Spiral Fracture of the Tibia and Fibula, 717.
Spleen, Ruptured, 186.
Splenectomy for Pernicious Anæmia, 121.
Stenosis of Stomach after Swallowing Hydrochloric Acid, 757.
Stetten, De Witt: Capsulorrhaphy for Persistent Subglenoid Dislocation of Shoulder, 749; Cranioplasty for Large Temporal Defect, 113; Fatal Cases of Carbuncle of the Face and Lips, 767; Longitudinal Section of Patella for Treatment of Joint Mouse, 750.
Stewart, George D.: Acute Perforated Ulcer of the Stomach or Duodenum, 349.
Stoma, Stenosis of Gastro-enterostomy, 627.
Stomach, Cancer of the Cardiac End of the, Relative Merits of Gastrostomy and Jejunostomy in the Treatment of, 746; Complete Cast of the, Following a Burn, 756; Hour-glass Contracture of the, Late Results of Midgastric Resection for, 760; Duodenum, Acute Perforated Ulcer of the, 349; Ulcer of the Lesser Curvature and Posterior Wall of the, Jejunostomy in, 747; Ulcers, Penetrating, Partial Gastrectomy for, 247.
Sullivan, Raymond P.: Non-tubercular Kidney Infections, 478.
Summers, John Edward: Sciatic Hernia, 672.
Swanbeck, C. E.: Gas Cysts of the Intestines, 620.
Sweet, J. E.: Lymphatics of the Gall-bladder, 241.
Symmers, Douglas: Serum Treatment of Anthrax Septicæmia, 663.

T

Taylor, Alfred S.: Anomalous Abdominal Membranes, 513.
Temporal Defect, Large, Cranioplasty for, 113.
Tension Buttons, Skin, 745.
Tetany, Post-operative, with Implantation of Human Parathyroids, 418.
Thomas, B. A.: Carcinomatous Papilloma of the Renal Pelvis, 242.
Thompkins, Wm. J.: Umbilical and Inguino-labial Hernia, 639.
Thyroid Gland, Special Points in the Technic of Operations on the, 47; The Low Transverse Incision in Operations on the, 686.
Thyroid Toxæmia, 740.
Tibia and Fibula, Spiral Fracture of the, 717.
Tibia-fracture Involving Ankle-joint, 243.
Tibial Cyst, Bone Transplantation for, 736.
Tinker, Martin B.: Wound Incision in the Treatment of Compound Fractures, 38.
Todd, T. Wingate: Posture and the Cervical Rib Syndrome, 105.
Torek, Franz: Splenectomy for Pernicious Anæmia, 122.
Transverse Abdominal Incision, 70.
Traumatic and Industrial Hernia, 467.
Tuberculous Abscesses of the Chest Wall, 404.
Tuberculosis in the Spine, Secondary Foci of, 95; of the Elbow, 744; Surgical, with the Carbon Arc Lamp, The Treatment of, 400.
Tumors, Bone, Cystic Diseases of, 506; of the Breast, Benign and Malignant, 631.

U

Ulcer, Bleeding of the Duodenum Associated with Cholecystitis, 459; of the Stomach or Duodenum, Acute Perforated, 349.
Umbilical and Inguino-labial Hernia, 638.
Ureteral Stone, Large, in an Infant, 763.

V

Van Beuren, Frederick T.: Lethal Factors in Acute Ileus, 423.
Vanden Berg, Henry J.: Peritonitis as a Complication of Prostatectomy, 668.
Ventral Hernia, Spontaneous Lateral, 677.
Volvulus of the Sigmoid, 724.
Von Recklinghausen's Disease, 171.

W

Walker, John B.: Traumatic and Industrial Hernia, 467.
War Injuries Coming to Subsequent Operation, 389.
Wells, J. Ralston: Lymphosarcoma, 507; Primary Axillary Lymphosarcoma, 509.

WHIPPLE, ALLEN O.: Pressure of the Drainage Tubes as a Factor in Stenosis of the Bile Duct, 381; Radium or X-ray Therapy Before and After Operation of Breast Tumor, 632.

WHITE, C. Y.: Cystic Diseases of Bone Sarcoma, 506.

WHITE, WILLIAM C.: Tumors of the Breast, 641, 631.

WIENER, JOSEPH: Carcinoma of Transverse Colon, Resected, 636.

WILENSKY, ABRAHAM O.: The Value of Dakin's Solution in the Treatment of Chronic Osteomyelitis, 708.

WILLIS, A. MURAT: Dilation of Extrahepatic Ducts with Removal of Gallbladder, 241; Problems in Connection with the Surgery of the Biliary Tract, 196.

WINSLOW, NATHAN: Extracranial Aneurism of the Internal Carotid Artery, 688.

WOOD, J. K. W.: Results of High Ligation of the Cystic Duct in Cholecystectomy, 203.

WOOLSEY, GEORGE: Results of Midgastric Resection for Hour-glass Contracture of Stomach, 762; Stenosis of Stomach after Swallowing Hydrochloric Acid, 757.

WORCESTER, JAMES N.: Cyst of the Popliteal Space, 246.

Wound Incision in Treatment of Compound Fractures, 38.

X

X-ray Cure of the Elbow, 744.

X-ray Radiation upon Breast Cancer, Unusual Result After, 117.

Y

YOUNG, JAMES K.: Bone Transplantation for Tibial Cyst, 736; Disarticulation of the Hip, 736; Von Recklinghausen's Disease, 171.

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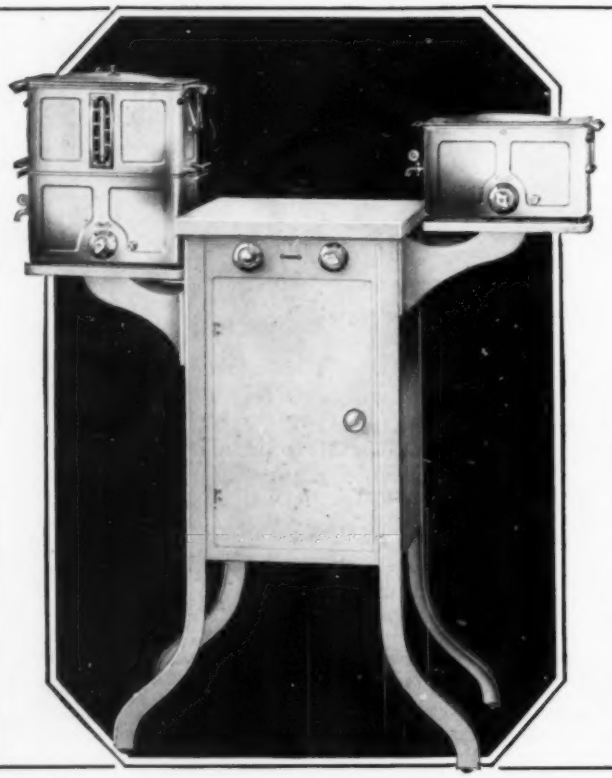

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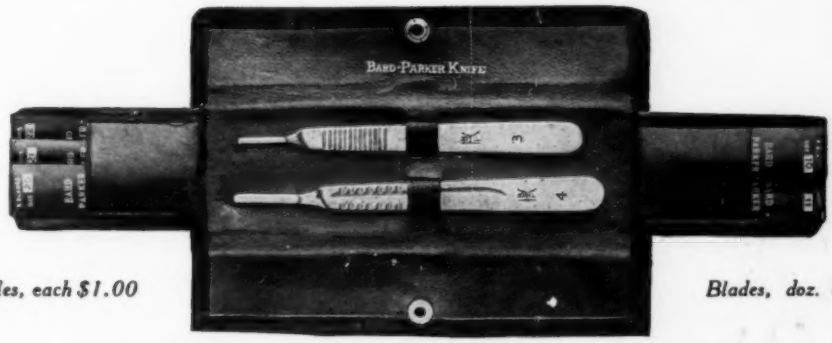

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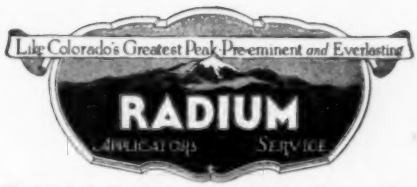
INDEX TO ADVERTISERS

(*Continued on page 6*)

	PAGE
SURGICAL INSTRUMENTS	
Bard-Parker Co.	3
Katherine L. Storm, M.D.	23
Victor X-Ray Corporation	14
H. G. McFaddin Co.	15
MacGregor Instrument Co.	11
Precision Thermometer & Instrument Co.	17
Campbell Electric Co.	11
RADIUM	
Radium Company of Colorado, Inc.	5
MISCELLANEOUS	
Antidolor Mfg. Co.	21
George R. Fuller Co.	21
Geo. W. Brady & Co.	22
A. A. Marks	3
Kny-Scheerer Corporation	10
FOOD PRODUCTS	
Valentine Meat Juice Co.	Cover
HOTELS	
The Martinique	20
The Breakers	23
Chalfonte-Haddon Hall	24
STERILIZERS	
Wilmot Castle Co.	10
The Pelton and Crane Company	2
Castle Co.	10
The Prometheus Electric Co.	15



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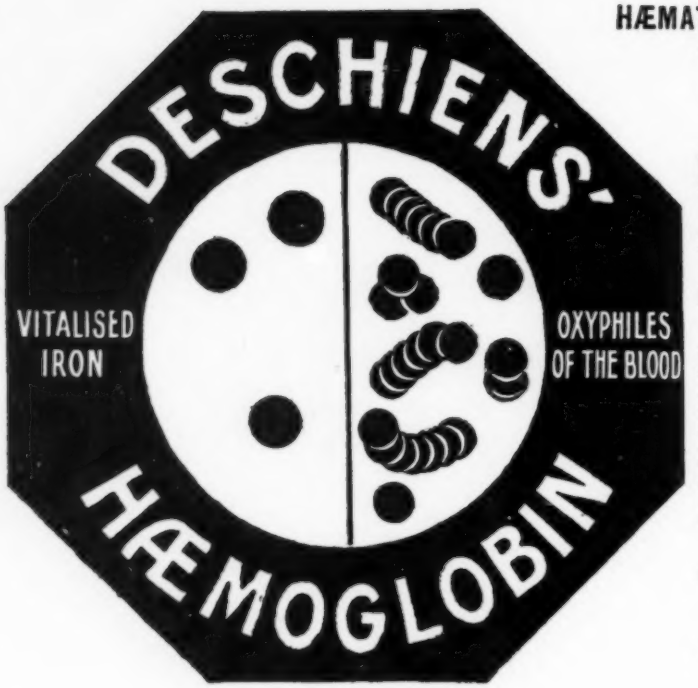

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INDEX TO ADVERTISERS, CONTINUED FROM PAGE 4 PAGE

X-RAY PLATES AND APPARATUS

Eastman Kodak Co. 19

PHARMACEUTICAL SUPPLIES

Dermatological Research Institute, Inc. 18
Lambert Pharmacal Co. 17
H. A. Metz Laboratories 13
G. H. Sherman, M.D. 22
Schering & Glatz 20
Fellows Medical Mfg. Co. 1
Purdue Frederick Co. 18
New York Intravenous Laboratory 4
Parke, Davis & Co. 12
Farwell & Rhines 21
Intravenous Products Co. of America . . . . . Cover
Physicians Supply Co. 2
Parmele Pharmacal Co. . . . . Cover
Armour & Co. . . . . Back Cover
G. J. Wallau 6
W. D. Young Company 7
H. K. Mulford Company 9

LIGATURES

Davis & Geck 16
C. DeWitt Lukens Co. 16

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Claustro-Thermal Catgut

Aseptic

CLAUSTRO-THERMAL, the improved method of heat sterilization, consists in applying the heat after closure of the tubes, thus avoiding all the chances of accidental contamination.[1] Sterilization by this positive method is made feasible by use of toluol as the tubing fluid, instead of the unstable chloroform.[2]

No other mode of sterilization so completely fulfills the exacting requirements for the production of ideal sutures as does the Claustro-Thermal method. It preserves the natural physical characteristics of the strands, while the destruction of all bacterial life is absolutely assured.

Claustro-Thermal catgut is aseptic though not germicidal. Not being impregnated with any bactericidal substance, it is inert in the tissues, exerting no inhibitive action.

These sutures are boilable. The tubes even may be autoclaved up to 30 pounds pressure for sterilizing their exterior preliminary to use. The heat sterilization procedure is described on the following page.

VARIETIES OF CLAUSTRO-THERMAL CATGUT

Each Tube Contains Approximately Sixty Inches

Plain Catgut	No. 105
10-Day Chromic Catgut	No. 125
20-Day Chromic Catgut	No. 145
40-Day Chromic Catgut	No. 185

SIZES: 000...00...0...1...2...3...4

In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$3

A wholesale discount of 25% is allowed on one gross or more ($27 net per gross); carriage paid

Kalmerid catgut imbedded in agar infected with Staphylococcus pyogenes aureus

Iodized catgut imbedded in the same medium. Note the proximity of colonies

Kalmerid Catgut

Antiseptic

KALMERID CATGUT is an improved germicidal suture superseding iodized catgut.[3] It is not only sterile, but, being impregnated with potassium-mercuric-iodide—a double iodine compound—the sutures exert a local bactericidal action in the tissues.[4] It differs from the Claustro-Thermal catgut only in this respect.

The serious disadvantages of iodized catgut—deterioration, irritation, and impaired tensile strength—have been overcome through the use of potassium-mercuric-iodide instead of iodine. Unlike iodine, it does not break down under the influence of light or heat, it is chemically stable, and it is neither toxic nor irritating to the tissues. It interferes in no way with the absorption of the sutures, and is not precipitated by the proteins of the body fluids.[5,6,7]

These sutures are boilable. The tubes even may be autoclaved up to 30 pounds pressure for sterilizing their exterior preliminary to use. The heat sterilization procedure is described on the following page.

VARIETIES OF KALMERID CATGUT

Each Tube Contains Approximately Sixty Inches

Plain Catgut.....	Boilable Grade.....	No. 1205
10-Day Chromic.....	Boilable Grade.....	No. 1225
20-Day Chromic.....	Boilable Grade.....	No. 1245
40-Day Chromic.....	Boilable Grade.....	No. 1285

SIZES: 000...00...0...1...2...3...4

In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$3

A wholesale discount of 25% is allowed on one gross or more ($27 net per gross); carriage paid

Kalmerid catgut is made also in an extra flexible grade, which is non-boilable, and which is described on the following page.

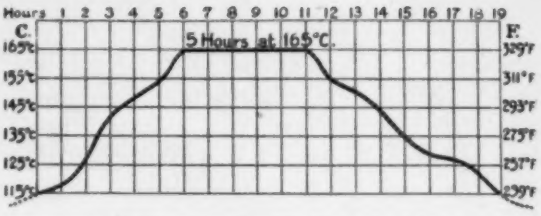
GERMICIDAL EFFICIENCY AS COMPARED WITH IODIZED CATGUT

The marked inhibitory power of Kalmerid catgut, as compared with iodized sutures, is strikingly shown in these reproductions of culture plates. The lighter areas about the imbedded sutures represent zones of no bacterial growth, while the darker portions are masses of Staphylococcus colonies. It is evident that Kalmerid sutures exert in the tissues a far greater antiseptic action than do the usual iodized sutures.[4,7]

See Advertisement on Page 16

Method of Sterilization

BOTH Claustro-Thermal and the boilable grade of Kalmerid catgut, described on preceding page, are subjected to the same sterilizing procedure: the sealed tubes are submerged in a bath of cumol and there exposed for five hours to the rigorous temperature of 165° C. (329° F.).[1] It is obvious that sterility is absolutely assured. Rigid bacteriologic control is maintained.



Kalmerid Catgut—(Non-Boilable Grade)

Extra Flexible

THE NON-BOILABLE grade of Kalmerid catgut differs from the boilable variety described on the preceding page in that it possesses extreme flexibility—a characteristic sometimes desired by surgeons accustomed to the use of iodized catgut.[7] It is impregnated with potassium-mercuric-iodide, and the sutures exert a local bactericidal action in the tissues.

Potassium-mercuric-iodide is the double salt of iodine and mercury, the chemical formula of which is $HgI_2.2KI$.[6] Through its use the serious disadvantages of iodized catgut—deterioration, irritation, and impaired tensile strength—have been overcome.[8] It is one of the most active germicides known, exerting a killing action on bacteria about ten times greater than that of iodine.[4,5] Physiologically it is bland and is entirely compatible with the tissues, not being precipitated by the proteins of the body fluids.

VARIETIES OF THE NON-BOILABLE GRADE OF KALMERID CATGUT

Each Tube Contains Approximately Sixty Inches

Plain Catgut.....Non-Boilable Grade....No. 1405
10-Day Chromic....Non-Boilable Grade....No. 1425
20-Day Chromic....Non-Boilable Grade....No. 1445
40-Day Chromic....Non-Boilable Grade....No. 1485

SIZES: 000...00...0...1...2...3...4

In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$3

A wholesale discount of 25% is allowed on one gross or more ($27 net per gross); carriage paid

Kalmerid Kangaroo Tendons

Boilable and Non-Boilable

KALMERID KANGAROO TENDONS are the sutures par excellence for those procedures in which post-operative tension is excessive, or long continued apposition necessary, such as in herniotomy, and in tendon and bone suturing. They are not only sterile, but, in addition, are impregnated with potassium-mercuric-iodide, as in Kalmerid catgut, which enables them to exert a local bactericidal action in the tissues.[3,4]

They are genuine kangaroo tendons; they are smooth, straight, of uniform contour, and possess a tensile strength about twice that of catgut.

The tendons are chromicized, and so accurately is the process regulated that each size will maintain apposition in fascia or in tendon for approximately thirty days.[8]

Kalmerid kangaroo tendons are prepared in two grades—boilable and non-boilable. The latter are extremely pliable.[7]

VARIETIES AND SIZES

Non-Boilable are Product No. 370
The Boilable are Product No. 380

Each Tube Contains One Tendon
Lengths Vary From 12 to 20 Inches

STANDARD SIZES: 0...2...4...6...8

Formerly termed extra fine, fine, medium, coarse and extra coarse, respectively

In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$3

A wholesale discount of 25% is allowed on one gross or more ($27 net per gross); carriage paid

THE PERMEATION OF KALMERID SUTURES BY POTASSIUM-MERCURIC-IODIDE

The light shaded specimen is a cross section of a strand of plain Kalmerid catgut, highly magnified.

The dark shaded specimen is a cross section of the same strand reacted upon by ammonium sulphid to precipitate the mercuric element.

The uniform color throughout the section shows the thorough permeation by the potassium-mercuric-iodide, the equable distribution of which assures a supply of this germicidal substance in the tissues until the suture is entirely absorbed.

General Qualities

THE SALIENT FEATURES of all varieties of D&G Sutures are compatibility with the tissues, perfect absorbability, maximum tensile strength, accuracy of sizes, flexibility, and absolute sterility. They are unaffected by age or light, or by extremes of climatic temperatures.

Unabsorbable Sutures

Heat Sterilized After Closure of Tubes—Boilable

Product No.		Approximate Quantity in Each Tube	Standard Sizes
350	Celluloid-Linen Thread	60 Inches	000, 00, 0
360	Horsehair	4 28-In. Sutures	00
390	Plain Silkworm Gut	4 14-In. Sutures	00, 0, 1
400	Black Silkworm Gut	4 14-In. Sutures	00, 0, 1
450	White Twisted Silk	60 In	000, 00, 0, 1, 2, 3
460	Black Twisted Silk	60 In	000, 0, 2
480	White Braided Silk	60 In	00, 0, 2, 4
490	Black Braided Silk	60 In	00, 1, 4

In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$3

Wholesale discount of 25% allowed on gross or more; carriage paid

Short Length Sutures

Heat Sterilized After Closure of Tubes—Boilable

Product No.		Approximate Quantity in Each Tube	Standard Sizes
802	Plain Catgut	20 In	00, 0, 1, 2, 3
812	10-Day Chromic Catgut	20 In	00, 0, 1, 2, 3
822	20-Day Chromic Catgut	20 In	00, 0, 1, 2, 3
862	Horsehair	2 28-In. Sutures	00
872	Plain Silkworm Gut	2 14-In. Sutures	0
882	White Twisted Silk	20 In	000, 0, 2

In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$1.50

Wholesale discount of 25% allowed on gross or more; carriage paid

Sutures With Needles

Heat Sterilized After Closure of Tubes—Boilable

Product No.		Approximate Quantity in Each Tube	Standard Sizes
904	Plain Catgut	20 In	00, 0, 1, 2, 3
914	10-Day Chromic Catgut	20 In	00, 0, 1, 2, 3
924	20-Day Chromic Catgut	20 In	00, 0, 1, 2, 3
964	Horsehair	2 28-In. Sutures	00
974	Plain Silkworm Gut	2 14-In. Sutures	0
984	White Twisted Silk	20 In	000, 0, 2

Emergency Needle
For Skin, Muscle, or Tendon

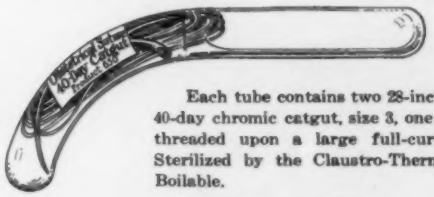
In packages of twelve tubes of a kind and size

List Price per dozen tubes (in U. S. A.).....$3

Wholesale discount of 25% allowed on gross or more; carriage paid

Obstetrical Sutures

For Immediate Repair of Perineal Lacerations



Each tube contains two 28-inch sutures of 40-day chromic catgut, size 3, one of which is threaded upon a large full-curved needle. Sterilized by the Claustro-Thermal method. Boilable.

One tube in a package

Product No. 650. List Price per tube.....$ .35

Wholesale discount of 25% allowed on gross or more; carriage paid

Circumcision Sutures

Heat Sterilized After Closure of Tubes—Boilable

Each tube contains a 30-inch suture of plain catgut, size 00, threaded upon a small full-curved needle.

In packages of twelve tubes

Product No. 600. List Price per dozen tubes.....$3

Wholesale discount of 25% allowed on gross or more; carriage paid

Umbilical Tape

Heat Sterilized After Closure of Tubes—Boilable

Each tube contains two 12-inch ligatures of a specially woven flat tape one-eighth inch wide

In packages of twelve tubes

Product No. 892. List Price per dozen tubes....$1.50

Wholesale discount of 25% allowed on gross or more; carriage paid

Standard Sizes For All Sutures

000 ——————
00 ——————
0 ——————
1 ——————
2 ——————
3 ——————
4 ——————
6 ——————
8 ——————

IN conformity with the long recognized need for a unified system of sizes, the standard scale of catgut sizes now embraces all sutures, including kangaroo tendons, silk, horsehair, silkworm gut, and Pagenstecher's celluloid-linen thread.

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(*Archives of Pediatrics, March, 1922*).

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PERTUSSIS SEROBACTERIN MIXED produces a degree of passive immunity immediately and permits of larger and more frequent dosage to produce a high degree of active immunity. Result—Quicker and stronger protection.

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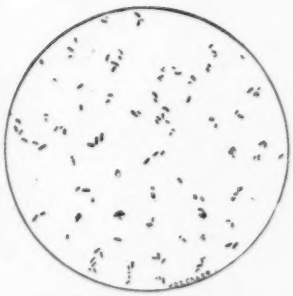

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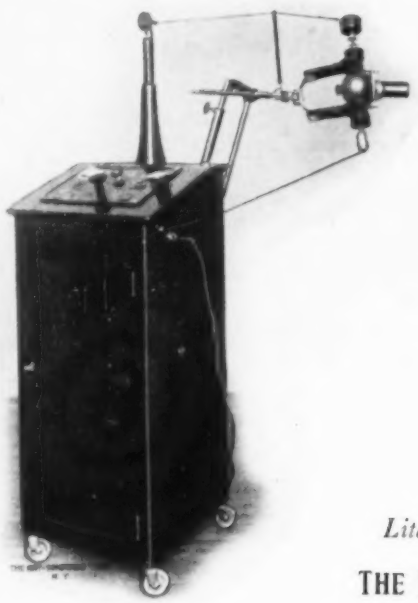

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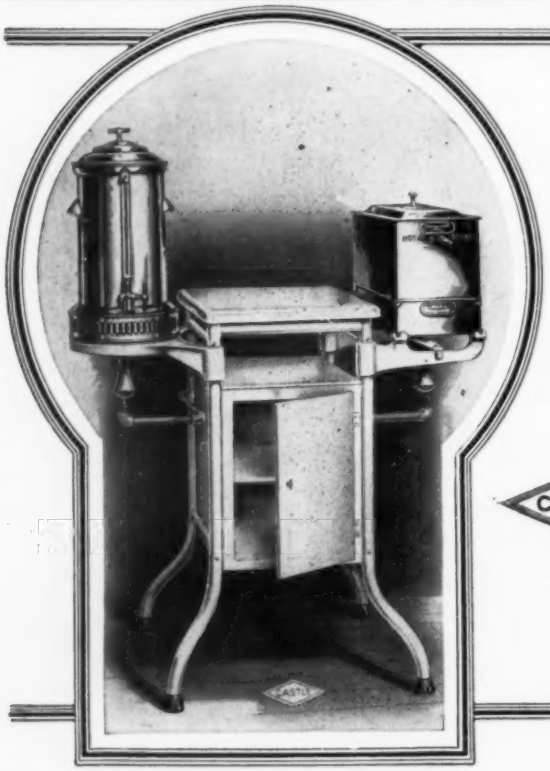

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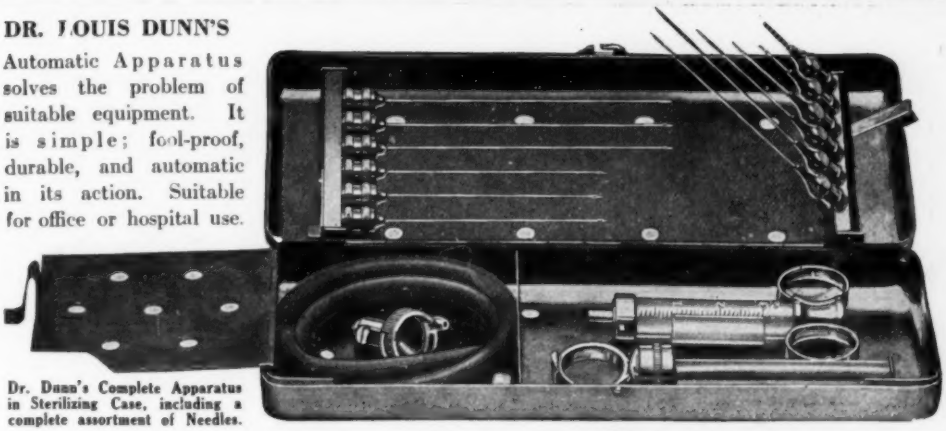

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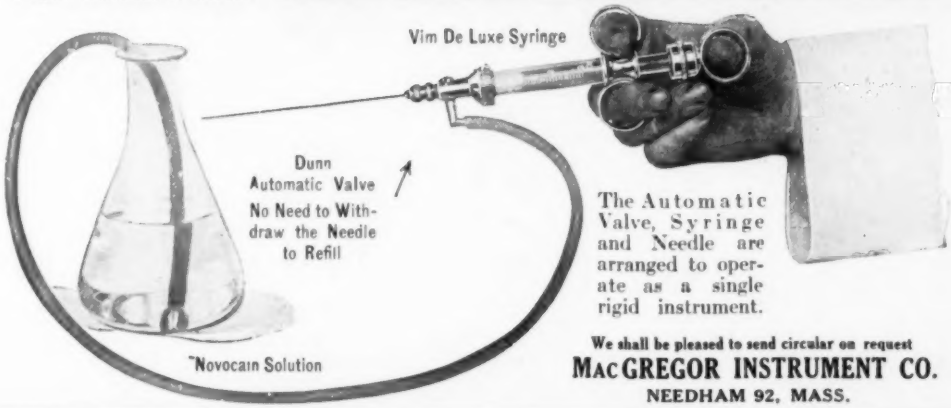

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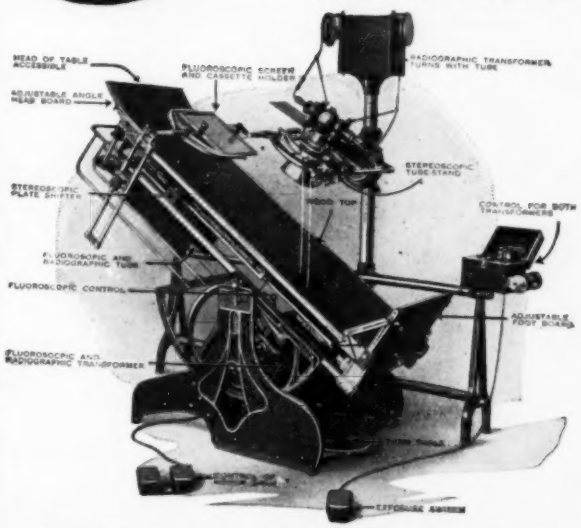

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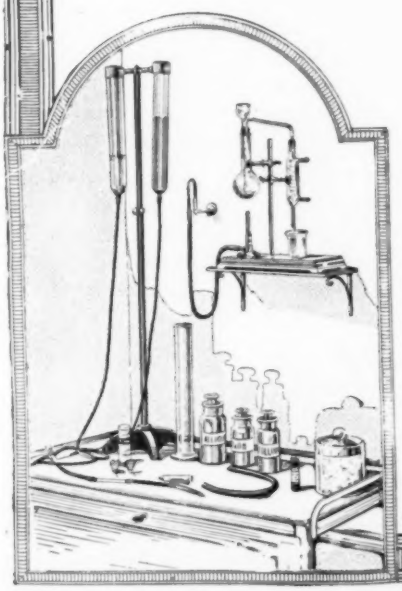

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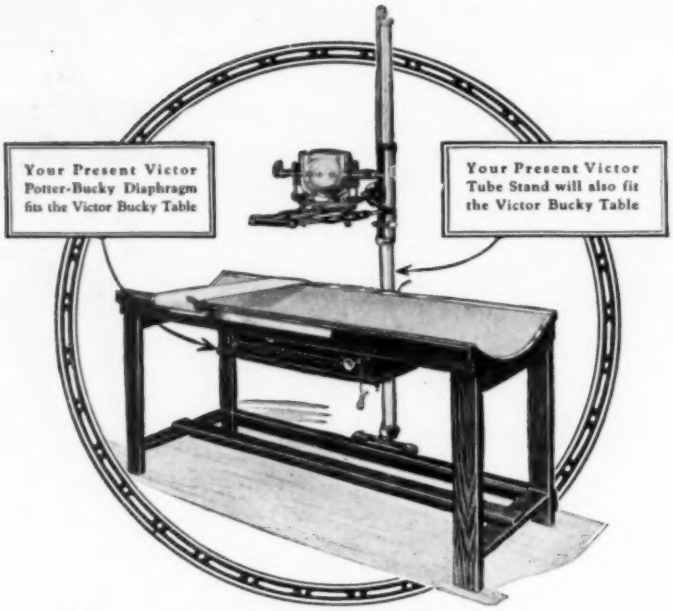
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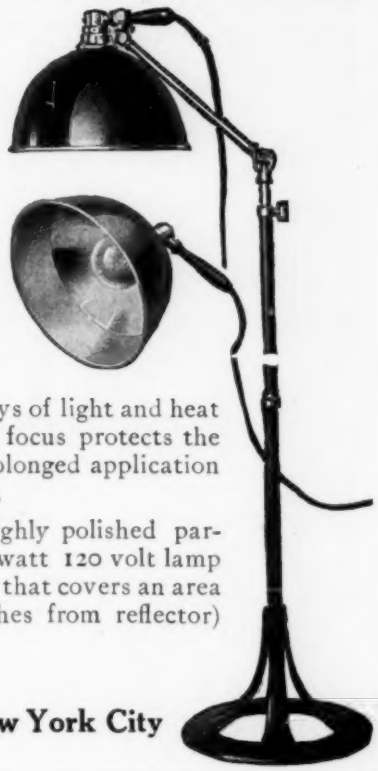

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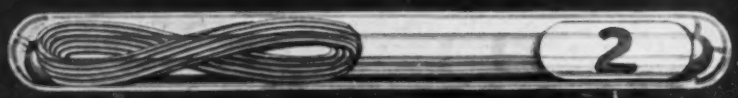

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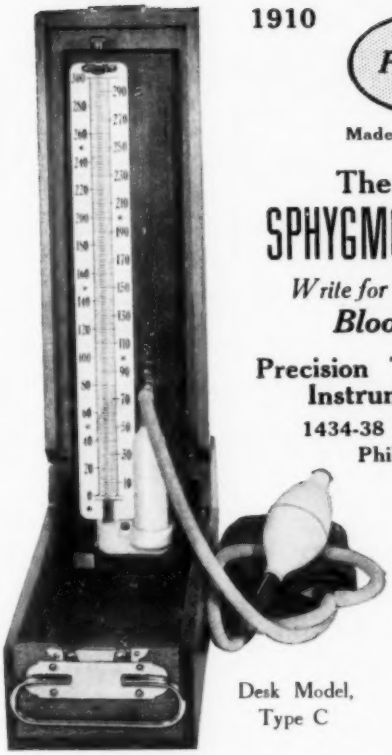
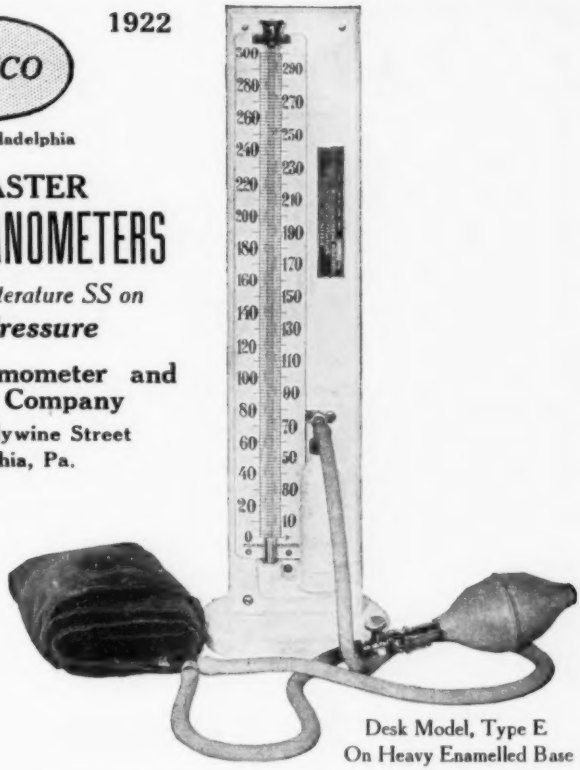


Desk Model,
Type C



Desk Model, Type E
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